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Sacro-Iliac Strain

Rodney F. Atsatt, M.D., F.A.C.S.

The usual pathological conditions associated with the sacro-iliac joint may be classed as strains or arthritis. The strains occur as the simple single acute strain or as a repeated chronic type. Arthritic changes in the joint are usually associated with such changes in other joints. There may be an isolated arthritis associated with trauma or disease, or occasionally there may be seen a tuberculous or other suppurative form.

I. Anatomy

Bony Structures: There are three bones involved, the two ilia and the sacrum. In the placement of these bones there are two important bony arches—the femoro-ilio-sacral arch anteriorly and the ischio-ilio-sacral arch posteriorly. Between these two arches is wedged the sacrum, wider anteriorly than posteriorly and larger above than below. From the standpoint of backward thrust this keystone is mechanically perfect, but from the standpoint of forward thrust the wedge is the reverse of that used in ordinary mechanics. Thus there is an essential weakness in the pelvic ring, causing it to be supported almost entirely by ligaments when the sacrum is exposed to a forward rotation.

Ligamentous Structures and Capsule: There are four ligamentous structures reinforcing each sacro-iliac joint. The anterior ligaments, blending with the capsule, extend from the alae of the first, second and third sacral segments on to the anterior aspect of the ilium. These ligaments are thin, and Sashin[1] states that they may often tear on slight separation of the pubis. The posterior supportive structures are in two layers and are massive in character. The outer layer consists of the short and long sacro-iliac ligaments—dense, tough fibrous masses. The inner layer consists of a group of short interosseus bundles of varying lengths extending in various directions across the joint. These bundles criss-cross and lock into one another to make a strong cohesive support. These as stated by Meckel[2] never rupture, the bony origins separating first.

The great sciatic ligament arises from a broad base at the posterior inferior spine of the ilium and the fourth and fifth transverse tubercles of the sacrum, and from the lower part of the lateral margin of that bone and inserts into the tuberosity of the ischium. This strong ligament acts then as a check rein on forward rotatory motions of the sacrum on the ilium, and when such motion has occurred, tenderness along this ligament, as evidence of strain, is a valuable diagnostic sign. The lesser sciatic ligament is also a factor in the control of rotatory motion in the joint, but is less readily palpable except in very thin atonic individuals.

Involved Musculature: The great sciatic ligament gives origin throughout its whole extent to the fibers of the gluteus maximus muscle, and from its lower portion gives rise to a portion of the long head of the biceps and the semitendinosus, the importance of which will be seen later. The pyriformis muscle arises from the lateral part of the ventral surface of the second, third and fourth sacral vertebrae, from the posterior border of the great sciatic notch and from the deep surface of the sacro-tuberous or great sciatic ligament. In twenty per cent of individuals there is a separation of the body of the muscle into two portions between which passes the sciatic nerve or at least the external popliteal division. This bit of anatomy is also of considerable importance in the explanation of sacro-iliac phenomena.

Joint Structure: The sacro-iliac joint is a diarthrosis and undoubtedly permits of motion under some circumstances. The articular surfaces are covered with hyaline cartilage, thicker on the sacral side and are separated by a space containing synovial fluid. In the female, there are relatively small apposition surfaces with strong extensive ligaments. In the male the apposing surfaces are greater in extent with smaller ligaments. Sashin states that mobility in the joint is usually only slight, but that it was present in all specimens of the cases under thirty years of age which he examined. He further states that mobility in the joint decreases with advancing age.

II. Etiology

Age incidence of strains varies from early adolescence to old age. The youngest patient under our observation having a true sacro-iliac strain was eight years of age, the oldest seventy-two. The decade from thirty to forty probably furnishes the greatest number of active cases.

The race incidence depends upon the locality and type of practice, as industrial laborers make up a good share of the acute cases.

The sex incidence shows an interesting grouping. There are distinctly more women patients in the well-to-do class, while in the working class the men predominate. Furthermore motion in the sacro-iliac joints disappears earlier in men than in women.

Predisposing factors may be grouped as a number of anatomical and functional variables. Spina bifida of the sacrum offers poor attachments for the posterior sacro-iliac ligaments. A long torso with thick vertebral segments or six lumbar vertebrae gives opportunity for

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Read before the Southern California Medical Society.

tremendous leverage on the lower sacrum. A nearly horizontal sacrum also is a poor mechanical device from this standpoint. An asymmetrical pelvis produces an unequal strain on the sacro-iliac joints, as does also the pelvis which is tilted by a short leg.

Work which involves the occasional lifting of heavy objects causes unaccustomed muscle stress and if this is not distributed evenly by proper lifting technique there is apt to be sacro-iliac strain.

Pregnancy with delivery often is the cause of a sacro-iliac strain due to the relaxation of the ligaments and rotation of the joint during delivery or upon initial weight bearing. In the same way long confinement in bed is productive of a relaxation of the ligaments and simple turning in bed may produce the accident of sacro-iliac strain.

From the arthritic standpoint the joint is subject to the usual changes concomitant with focal infection, intestinal toxemia, metabolic imbalance, as well as to traumatic changes. Thus an acute strain may become chronic through the arthritis set-up by repeated strain traumata, as well as by ordinary rheumatic processes. Also, there are changes due to occasional infections by the cocci, tubercule bacillus and lues.

III. PATHOLOGY

(1) From a pathological standpoint there may be any one or more of the following conditions present in a sacro-iliac disturbance. There may be a simple strain of the ligaments, perhaps most commonly brought about by a forward rotation of the sacrum on one or both ilia. This causes strain and irritation on the posterior sacro-iliac interosseus and sacro-tuberous ligaments. These irritated and strained ligaments are easily palpable on the average patient. As has been suggested, the sacro-tuberous ligament acts as a check rein on forward rotatory movements of the sacrum and the very slight motion of four degrees, as shown by Sishin, is sufficient to cause a strain on these tough and unyielding ligamentous structures.

(2) With this irritated great sciatic ligament in mind it also becomes possible to account for the spasm of the pyriformis muscle, for as we have seen the pyriformis arises in large part from the sacrum and great sciatic ligament. The change in this muscle then accounts for two prominent symptoms of sacro-iliac strain, namely pain referred to the region of the hip joint and pain referred along the distribution of the sciatic nerve, especially the external popliteal branch. The sacral plexus lies directly on the pyriformis muscle or very often passes between two halves of the muscle so that the slightest spasm would cause nerve irritation. Yeoman[3] suggests this as a cause of sciatica but fails to elaborate sufficiently on this extremely important role of the pyriformis, and other investigators have likewise overlooked it.

(3) Closely allied to the above condition is the spasm of the hamstring muscles which is often seen. A considerable proportion of the origin of the long head of the biceps as well as the semitendinosus is from the great sacro-sciatic ligament, and thus any pull on the hamstring muscle is communicated directly to this irritated ligament. Furthermore, such a pull gives an associated strain on the somewhat movable joint.

(4) Distinguished from the rotatory motions of the sacro-iliac joint which may involve any or all of the above changes, there must be considered the actual rotatory dislocations. These often are present in those patients who come in with severe continued pain and who are relieved by manipulation, sometimes with an audible click. These are usually forward rotations of the sacrum on the ilia and are therefore relieved by hyperextension of the affected leg.

(5) Lastly, under pathological conditions we must consider arthritis of the joint. As with arthritis of other joints, there will be periarticular thickening, spasm and irritation, and as the sciatic nerve also lies for part of its course directly on the anterior sacro-iliac ligaments, there is another reason to link sciatica with sacro-iliac disturbance.

TREATMENT

(1) Strapping: The skin is cleansed thoroughly with ether and shaved. A five-piece three-inch strapping in two layers is applied, extending from mid-lateral line on one side to the same point on the opposite side, including one inch of the gluteal fold and the spine of the fourth lumbar. It should be left on from four to seven days and then replaced by a belt or girdle.

(2) Bed rest: If strain is acute there should be a week of bed rest. The position in bed is important. If the patient normally lies on his back, two pillows should be placed under his knees. If he sleeps on his side or face, he should lie half way on his side and face with his affected hip and knee drawn up and a good sized pillow placed under his lower abdomen and under the affected thigh.

(3) Fitting of belt: In our opinion the one main principle involved in all fixation apparatus for sacro-iliac strain is that the final pressure on the ilia and gluteal regions shall be toward the posterior midline. Therefore, all belts must be tightened from the back, that is, back laced. This maneuver supports the strained posterior ligaments. The belt or girdle is applied after one week's fixation in adhesive. It should be worn for two to three months, accompanied by regular systematic exercises designed to strengthen the low back.

(4) Heel corrections: Under therapy must be mentioned the pelvic asymmetry which accompanies the congenital or traumatic short leg. Fully fifty per cent of patients presenting low back symptoms have a disproportion in their leg measurements. The condition is easily overcome by the addition of a lift on the heel and often the relief is almost instantaneous.

(5) Physical Therapy: This department furnishes, for the second week, baking and massage. The patient is then usually ready to add a few simple lying exercises for abdomen and back. Later, as tolerated, these exercises increase in difficulty until after two or three months the patient is turned out with a well developed and strengthened back, and with small likelihood of recurrence.

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Physical Therapy in the Treatment of Sacro-Iliac Strain

Mabel Ward† and Luella Patterson*

The physical therapy treatment of sacro-iliac strains consists of radiant heat baking, massage and graduated exercises.

The radiant heat baking is given for twenty or thirty minutes depending on the intensity of the pain. The patient is placed in the prone lying position with a fairly hard, large pillow under the abdomen; a small soft one for the head; and a flat firm one under the knees. Sometimes it is necessary to use two pillows under the abdomen in order to obtain complete relaxation of the lower back muscles, for relaxation is essential during the baking.

The baking is given over the sacro-iliac region and over the thigh and leg if there is referred pain.

Massage is given to the whole back and the posterior thighs. A light massage is used at first, becoming heavier day by day as the pain decreases.

Exercises are started when the pain has not been constant over a period of twenty-four hours. These exercises are designed to strengthen the back muscles, the abdominal muscles, and the lateral trunk muscles, and to teach the patient to hold himself with the abdomen flat and the posture corrected. The patient is instructed to gradually discontinue the use of the belt or girdle after one month and to wear it only when there is apt to be excessive strain to that region. But he is urged to continue with the exercises for two or three months longer.

Following is an outline of the exercises used. However, they are prescribed to the individual needs, and other exercises are given if necessary. Careful check of the patient's posture and postural habits is made and exercises given according to these findings, also. We believe that if the body muscles are developed evenly and the patient taught to hold himself in good posture, the likelihood of a recurrence of the sacro-iliac strain is lessened.

A. Abdominal retraction or pelvic tilting.
   1. Back lying, knees bent up, hands behind neck, abdominal retraction (pulling abdomen up and in, overcoming any lumbar lordosis) hold four counts, relax.
   2. Sitting, hands behind back, abdominal retraction, hold four counts, relax.
   3. Standing, back to wall, heels three inches from wall, feet pointing straight ahead, hips, shoulders and head touching wall, abdominal retraction, hold four counts, relax.
   4. Standing, hands behind neck, abdominal retraction, hold four counts, relax.

B. Abdominal retraction with breathing.
   1. Back lying, knees bent up, hands behind back, abdominal retraction, hold and breathe in and out six times, relax.
   2. Sitting, hands behind neck, abdominal retraction, hold and breathe in and out six times, relax.
   3. Standing, back to wall, heels three inches from wall, hips, shoulders and head touching wall, hands behind neck, abdominal retraction, hold and breathe in and out six times, relax.
   4. Standing, hands behind neck, abdominal retraction, hold and breathe in and out six times, relax.

C. Abdominal retraction with hip flexion and extension.
   1. Back lying, knees bent, hands behind neck, abdominal retraction, hold, and extend and flex one leg five times, relax.
   2. Sitting, hands behind neck, abdominal retraction, hold, and lift one knee five times, relax.
   3. Standing, hands behind neck, abdominal retraction, hold, and lift one leg with knee flexed five times, relax.

D. Abdominal retraction with arm motions.
   1. Back lying, arms at sides, abdominal retraction, hold, and raise arms forward upward ten times, relax.
   2. Sitting, hands behind neck, abdominal retraction, hold, and stretch arms up overhead and return to position of hands behind neck five times, relax.
   3. Standing, hands behind neck, abdominal retraction, hold, and stretch arms up overhead and return to position of hands behind neck five times, relax.
   4. Standing, back to wall, heels three inches from wall, feet pointing straight ahead, hips, shoulders and head touching wall, hands behind neck, let head and elbows droop forward, abdominal retraction, hold, and pull head up and back at the same time pushing elbows back to touch wall, hold four counts, relax.

E. Abdominal retraction with walking.
   1. Standing, back to wall, heels three inches from wall, feet pointing straight ahead, hips, shoulders and head touching wall, hands behind neck, abdominal retraction, hold, and lean forward away from wall, return to wall, relax.
   2. Standing, same as above, abdominal retraction, hold, and lean forward away from wall, rise on toes, lower heels, return to wall, relax.
   3. Standing, hands behind neck, abdominal retraction, hold, and walk with high knee bending.
   4. Standing, hands behind neck, abdominal retraction, hold, and stretch arms up overhead and walk.
   5. Standing, hands behind neck, abdominal retraction, hold, and rise on toes and walk.
   6. Standing, hands behind neck, abdominal retraction, hold, and stretch arms up overhead at the same time rising on toes and walk.

F. For lateral trunk muscles.
   1. Back lying, hands behind neck, pull up on one iliac crest (shortening that leg) then relax it and pull up on other iliac crest, alternate ten times each.
   2. Standing, hands behind neck, pull up on one iliac crest.

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3. Standing, feet wide apart, arms raised sideward, touch toe of one foot with opposite hand (without bending knees). Alternate ten times to each side.
4. Standing, feet wide apart, arms raised sideward, bend trunk to left, putting left hand behind back and raising right arm up overhead, return to first position, alternate ten times to each side.

G. For back muscles.
1. Prone lying, hands behind neck, forehead on table, lift elbows backward, ten times.
2. Prone lying as above, lift elbows backward, hold, and lift head, return to first position, ten times.
3. Prone lying as above, lift one leg backward, keeping knee straight, ten times with each leg.
4. Prone lying, arms stretched overhead, hands clasped, lift arms keeping elbows straight, hold and lift head, return to first position, ten times.
5. Prone lying, hands behind neck, lift both legs together (keeping knees straight) ten times.
6. Prone lying, as above, lift elbows, lift head, and lift both legs, return to first position, ten times.
7. Prone lying, arms stretched overhead, hands clasped, lift arms, lift head, and lift both legs, return to first position, ten times.

H. For abdominal muscle.
1. Back lying, lift one leg straight as far as possible keeping other leg down flat, five times each leg.
2. Back lying, lift both legs up straight, ten times.
3. Back lying with feet held down, arm folded across chest, raise trunk to sitting position.
4. Back lying, hands behind neck, bend one knee up and swing opposite elbow around to touch it, replace, twenty times alternating.

The Classification of Chronic Arthritis

Russell L. Haden, M.D.*

Chronic arthritis is one of the most common of the chronic diseases seen by the clinician. A large share of the time of the average physical therapist is taken up with its treatment. A recent careful survey in Massachusetts showed that three per cent of the total population was suffering from some form of rheumatic disease, and that there were in this state more cases of rheumatism than of cancer, tuberculosis and heart disease combined. The great economic and humanitarian importance of chronic arthritis justifies much more study and interest by the medical profession than the disease has received. Lack of interest on the part of the physician is due largely to the great confusion and difference of medical opinion concerning almost every phase of chronic arthritis, to the poor results so generally obtained in the past from treatment administered inefficiently or from a narrow point of view, to the absence of any contagious feature necessitating public health measures, and to the extreme chronicity of morbidity with low mortality characteristic of the disease.

One of the most confusing aspects of chronic arthritis has been the multiplicity of terms used in discussing chronic joint disease and the widely varying classifications of types. Unfortunately, also, too much emphasis has been placed on infection as a sole etiologic factor. A primary etiologic classification of any disease is always the most desirable one. In the present state of our knowledge such a classification of arthritis is impossible since the etiologic factors are often multiple and often unknown. A clinical grouping is usually possible, however, and the pathologic classification is relatively simple.

The problem of classification may be simplified if the physician when confronted with a patient suffering from chronic arthritis will ask: (1) Is the joint disease due to mechanical trauma? (2) Does the patient have a specific infective arthritis due to the metastatic localization in the joints of bacteria of fixed type (gonococcus, streptococcus hemolyticus, staphylococcus aurens, pneumococcus) from a localized focus of infection caused by the same organism? (3) Is this gout? (4) Is there some constitutional or neurogenic disease, such as hemophilia or tabes dorsalis, in the course of which the joint may be involved? (5) Is the patient suffering from rheumatic fever? (6) Is this a chronic nonspecific arthritis not due to any of the foregoing causes or may it be due to a combination of these causes? A correct answer to these questions allows a classification of the patient's disease from a clinical standpoint.

Chronic traumatic arthritis is usually evident from the history and examination. The "tennis elbow," the "golfer's shoulder," the "house-maid's knee," are well known examples. It is important to remember, however, that trauma is often only superimposed on an already diseased, although asymptomatic joint and is thus a precipitating rather than primary etiologic factor. A specific infective arthritis, if chronic, has usually followed an acute involvement of the joints during the course of an acute infectious disease, such as pneumonia or osteomyelitis. The chronic stage concerns largely the end results of the invasion of synovial tissues and destruction of cartilage rather than the continuation of an active infection in the joint. Gout is easily recognized if kept in mind. A careful examination should reveal a constitutional, neurogenic, hematopoietic or metabolic disease which could cause the joint disability. True rheumatic fever is usually easy to recognize in the acute phase; when subacute or chronic it is often most difficult to differentiate from chronic atrophic (rheumatoid) arthritis. After these five divisions are separated off, a large group of patients remains in whom the arthritis is (1) not due to trauma, (2) not due to metastatic localization of bacteria of fixed type in the joint, (3) not gout, (4) not part of a constitutional or neurogenic disease and (5) not rheumatic fever. This group includes by far the largest number of the cases of chronic arthritis seen by the physician. It is best designated chronic nonspecific arthritis or chronic rheumatism. It is apparent that chronic nonspecific arthritis is not one disease but repre-

*Cleveland Clinic, Cleveland, Ohio.
Read before the annual meeting of The American Physiotherapy Association, Cleveland, June, 1934.

sents joint reactions to more than one inciting or contributing agent or agents. Unfortunately such cases have often been placed together under the heading of "chronic infectious arthritis" with the consequent implication that all result only from chronic infection.

After making a clinical classification from the history and examination, one should next visualize the pathologic changes taking place in the joint. Fortunately these are few in number and so furnish a basis for a further division of the group of patients with chronic nonspecific arthritis. Nichols and Richardson showed that all chronic joint disease is due either to proliferative changes beginning in the synovial membrane or to degenerative changes originating in the joint cartilage. All of the clinical groups can be classified on this basis. Traumatic arthritis is primarily proliferative, although the cartilage may suffer direct injury and new bone may form following injury. Specific infective arthritis is also a proliferative disease. In gout or in arthritis secondary to disease of the central nervous system, the joint changes usually follow degeneration in the cartilage. In chronic nonspecific arthritis the pathologic changes may be degenerative or proliferative. The clinical picture in these two groups is so different as to constitute usually two separate groups with little in common but joint involvement. In the light of our present knowledge these two primary pathologic changes may each possibly result from a number of causes, or even from the same cause.

Traumatic arthritis is a simple clinical problem; arthritis dependent on constitutional or neurologic disease is uncommon; specific infective arthritis seldom presents any diagnostic difficulties; gout should be easily recognized, although it is often overlooked. The possibility of gout should always be considered if the joint disease occurs in attacks with an entire return of the joint to normal between attacks. The roentgenograms may or may not be characteristic, and the blood uric acid is often not excessively high. These clinical types present a less important problem than chronic nonspecific arthritis which affects most of the patients with chronic arthritis seen by the physician.

The great clinical importance of the nonspecific group necessitates further discussion. The cases are subdivided on the basis of the pathologic changes described by Nichols and Richardson. The earliest tissue change in one type is a proliferation of the synovial membrane. Thickening results and adhesions develop following the growth of granulation tissue over the articular cartilage. Nichols and Richardson spoke of this type of rheumatism as "proliferative." The second type is characterized by a primary degeneration of the cartilage. The first change is a fibrillation or splitting of the joint cartilage. Later cartilaginous and bony overgrowths develop with little evidence of inflammatory changes in the cartilage or synovial membrane. The end result in this type is a loss of articular surface. Corresponding to the areas of eroded cartilage and bone, there takes place on the exposed articular surface a compensatory overgrowth of cartilage or bone which tends to keep the joint surfaces in contact. True bony ankylosis never occurs. Nichols and Richardson recognized a degenerative process as the fundamental factor here and designated this type of arthritis as "degenerative." They concluded that "the two types do not correspond to two definite diseases but each represents reaction of the joint tissues to a considerable variety of causes."

Long before the existence of two primary pathologic types was demonstrated, clinicians had recognized two clinical types. Garrod in 1890 proposed the terms, *rheumatoid arthritis* and *osteo-arthritis*. Goldthwaite in 1906 suggested the terms *atrophic* for the proliferative type, since the constant and usually early characteristic as demonstrated by the roentgenogram is an atrophy of bone structure, and *hypertrophic* for the degenerative type, since hypertrophy of bone is the outstanding radiologic characteristic of the disease. The different classifications used may be summarized as follows:

Author	*Classification based on*	*Types*
Garrod (1890, England)	Clinical data	1. Rheumatoid arthritis 2. Osteo-arthritis
Goldthwaite (1904, America)	Clinical and radiologic data	1. Atrophic 2. Hypertrophic
Nichols and Richardson (1909, America)	Pathologic data	1. Proliferative 2. Degenerative

The American Committee for the Control of Rheumatism has adopted the terms atrophic and hypertrophic although Garrod's classification is preferred by many workers in this country and is used in England.

In the broadest sense, the clinical manifestations of arthritis always represent a disturbance in the normal metabolism, or vital activity of the joint. As the result of some stimulus, which may be either a positive irritant or "the lack of something," the normal physiology of the joint is altered. The anatomic changes which we designate the pathology of the disease, follow the alteration in physiologic activity. Several evidences of disturbed physiology of the individual suffering from chronic arthritis are outstanding. The most important change is in the capillary circulation.

It is quite probable that a disturbed circulation is often the primary disturbance. Patients with the proliferative type of chronic nonspecific arthritis show cold, moist, cyanotic extremities almost constantly. The peripheral capillaries are small and often decreased in number. Pemberton has emphasized the importance of denial of normal content of the blood with muscle and joint tissue as the result of the circulatory disturbance. The basal metabolic rate is often altered. A disturbance in the metabolism of uric acid and of glucose can often be demonstrated. Numerous studies have shown a disturbance in calcium metabolism. Exhaustion, infection, age, deficiencies and other factors may initiate a disturbed physiologic activity.

There is no one cause for chronic nonspecific arthritis of either the proliferative or degenerative type. Perhaps most cases result from the interaction of several factors. The soil for chronic arthritis is often prepared by heredity, exposure, fatigue of body or mind, or ill health from other causes. The wider the viewpoint of the physician concerning possible etiologic factors and the more inteiligently all factors are studied, the more fortunate the patient will be.

I can not emphasize too strongly the need for consideration in every patient with chronic arthritis of: (1) a clinical grouping, (2) an understanding of the fundamental pathologic process, and (3) a study of the functional disturbances characteristic of the disease. Further studies will certainly throw more light on etiology. At the present time we have to be content with the opinion as stated by the American Committee for the Control of Rheumatism "that at the present time no single infectious agent or any completely defined dietary deficiency or metabolic disturbance has been conclusively shown to be the sole cause of these disorders."

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Junior and Senior High School Girls

Sarah U. Colby*

When school is over and the children flock out, those of us who stand on the curb and watch are conscious that school no longer means a dreary pursuit of lifeless subjects, but through interest, that Pied Piper of Childhood, the whole child is being developed to live a full, well-rounded life—now—at eight, or ten, or twelve years, not at some far distant age, such as forty, which she never expects to reach. Much is being said of the integrated program in the progressive school, which means the weaving together of the various experiences of life into a well coordinated unit. It is only under such a program that education becomes the growth of the child. The part in the program with which this paper is concerned is the physical well-being of junior and senior high school girls. It is impossible to segregate health as a separate subject, for it is woven into the very fabric of life. Health should be so positive in the school life that the individual is as unconscious of it as she is of most of the intangible essentials of life. It is only when these essentials are lacking that the realization of their absence impresses itself upon our consciousness. Health is an integrated subject.

There is always a large percentage of pupils to whom health is not a positive factor. They are, usually, quite ignorant of this lack and so struggle along just a little behind their schoolmates, or else lag perceptibly in all their school activities. In order that these students may have an opportunity to catch up with life, schools have classes arranged to care for their needs through applied instruction. Posture defects are the most obvious indication of this lack of positive health, and for that reason many classes have been called Posture Classes or classes in Corrective Physical Education. These classes are quite general throughout the country and it is of the opportunity which the school offers, the obstacles which must be met and overcome in the work, the type of work which may be done in the school in general and the results which may be expected, rather than the work of any one school system, with which this paper will deal.

Posture defects directly, or indirectly are the causes as well as the results of many orthopedic conditions. The school offers an incomparable opportunity for the discovery of these conditions; in minor cases for their correction, in serious cases for their guidance.

The Opportunity

The children are there. They do not have to be sought. They come to school with open minds believing in its wisdom, having faith in its instruction. There is not the problem of transportation. The pupil does not have to leave school to "go" anywhere. This may be an obstacle as well as an advantage for "going" after anything often raises its value and makes it more personal. The very fact that posture work is a part of the girl's school program holds her to it after the novelty has worn off. She does not have to be "excused" from anything for it. It is a daily class. The work is done under trained supervision, the only type of work of value. Outside interests do not crowd in, for a definite time is regularly set aside for the class. In school there is a competitive element as well as a co-operative spirit which gives a sporting flavor to an activity that otherwise might become tiresome and disliked. Posture tests, the value of which is greatly to be questioned, have a definite psychological value. A girl who is discovered before the mirror critically regarding her own posture, or questions such as, "Is my posture improving?" or "Isn't my standing better?" or "What splendid posture the girls had as they walked across the stage this graduation!" are all the results of group work, and to the teacher the very breath of life.

Faith healing sects (as though there were ever any healing without faith) prevent many children from going to a doctor's office, but they become members of a corrective or posture class without question, and submit to *tests* where *examinations* would not be permitted.

Perhaps the most important item under this heading of opportunity is the discovery of physical defects which become serious if allowed to go without care. These conditions are brought to the attention of the parent by the school nurse, school physician, or the teacher of the class. The child is not alarmed or embarrassed by personal talks with the corrective teacher because she recognizes such talks as part of the teacher's subject. The girls do not hesitate to go to the teacher for advice in health problems either for themselves or their families, any more than they would hesitate to ask their English teacher for advice regarding their summer reading.

These are some of the opportunities which the school offers for effective health guidance.

The Obstacles

Orthopedic physicians have frequently questioned the value of posture work in the schools. This is, perhaps, a misunderstanding rather than a criticism. The cases that go to the doctor's office are highly sifted. They are a small per cent of the total need. They are the most interested and usually the most intelligent. The fact that a child who has taken posture work in school that "didn't do her any good" comes to his office, may be an evidence of its success rather than its failure. It is true that only a small number of those who are exposed to corrective work will correct. The reasons for this are varied. The child's intelligence quotient may be so low that it is impossible to impress her with a knowledge of her own need. The child's home background may be poor, in which case, the girl is frequently laboring between the standards of the school and the standards, or lack of standards, of the home. Parents may be indifferent to the conditions which exist. If a girl has reached junior high school age with a marked scoliosis, or some other condition which has gone unnoticed by the parent, it is very probable that the mother has not been sufficiently interested in her child's development to watch her physical growth.

The personality of the teacher may be an obstacle. If she attempts to make her pupils feel guilty of bad

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posture she will also fail to give them the thrill of accomplishment in attaining good posture. The teacher must be well trained, she must also, be interested in the individuals of her class. She must know their opportunities and their handicaps. She must hold her pupils. At the risk of being called sentimental I venture to call it "mothering." If these qualities are lacking, desirable results will also be lacking.

That some of the classes have been called "Corrective" is unfortunate. It suggests failure and inferiority and creates an objection before the child knows what it is about, for no one wishes to be put in a corrective class in any subject. Frequently it causes ridicule from fellow students, and of all objections this is the hardest one to overcome. The term Posture Class does not cover the subject, and yet, in spite of its deficiency it carries a positive suggestion. Truly, those who have gone before us knew more of physiology than of psychology. Success can be attained only by developing healthy mental attitudes.

The attitude of the school and the teachers in it toward health work may be a great help or a great hinderance. If the child is looked upon as being incapable of regular school activities because she is "in Corrective" she will sincerely hate it. If, on the other hand, she is included with the other members of the school in their activities suitable to her ability, and is given an equal chance with the others in winning letters and honors in outdoor play and sports, the posture work will be taken as a matter of course and enjoyed. Instead of a stigma attached to the work it will be regarded as a means whereby those less able to compete in the vigorous athletics may have honorable standing through modified and adapted types of sports. Where the faculty is interested in the progress of the students in health lines, the work becomes of greater interest to the girls. Each school has a different personality and its problems are equally individual to the school.

TYPE OF WORK

Every girl in the school should be given a physical examination. Because of the various attitudes of the parents and the number of students to be examined these examinations must, of necessity, be brief and general, but detailed enough to discover physical defects. They should be made by a woman physician. When physical defects exist, parents should be advised either to see their own physician, or when funds are lacking, they should be referred to a school, city or county clinic. It is the work of the teacher, in cooperation with the school nurse to follow up these cases and attempt to arouse interest in the home where interest is lacking. The members of the classes are referred to such classes by the school physician. The conditions are various:

1. Posture: By far the greatest number enrolled in these classes have poor posture. They include all the postural conditions from general relaxed posture to structural conditions. Many come at the recommendation of their private physicians, and in some cases, prescribed exercises have been given to them, which are carried out in school. In these cases the physicians are consulted and their directions followed.

2. Foot conditions: She is, indeed, a clever teacher who can make foot work interesting over a period of months. Care of the feet, shoe corrections, and general foot hygiene are part of the program. The value of the advice of an orthopedic physician rather than the advice of the man who sells shoes must be emphasized. The far reaching effect of foot conditions, both economically and physically, must be emphatically presented.

3. Nutrition: At the present time many children who are malnourished are suffering from insufficient food, or from the lack of sufficient funds to provide an adequate diet. Unfortunately it takes the maximum of intelligence to provide a well balanced diet on a minimum income, and the unemployed are not expert dieticians. These children must first be provided with food, either through the school or through some outside organization.

The next group consists of the slender girls, and here again care must be taken to differentiate between the slender type and the actually thin child. Her color, muscle turgor, posture, nervous stability and weight must have equal consideration. Since weight is our only tangible measurement of progress in these cases, the children should be weighed once a month, not to determine the number of pounds below average weight but to know whether they are gaining or losing. If they are losing the cause must be discovered, and if possible, corrected.

Heart conditions: Every heart case must be under the care of a physician, and the directions of this physician carried out to the letter. An important part of the care of these cases is the adjustment of the girl's daily program in order that she may have as many classes as possible on one floor, that unnecessary climbing of stairs may be eliminated. She should be carefully watched for signs of fatigue. Her teachers should know her limitations and not tax her strength. She should have frequent reexaminations.

5. Hygiene: This important subject should have a prominent place in the plan of the work. The method of teaching it and the course of study depend upon the type of students, their ages, the community in which they live and the experience of the teacher. The subject which is an immediate problem, or of special interest to the pupils should be the subject for explanation, discussion and instruction. Care should be taken not to repeat the same subjects in the same way year after year, in order to prevent the child from becoming bored with it. Hygiene should be very practical and the students should participate in the class.

This great variety of conditions in each class makes group work a necessity. These groups are called squads. The members of the squad are taught their exercises, instructed as to why they are doing them and the results that should be expected. When each group understands what is to be done, a squad leader is appointed who becomes the business manager. She must be a capable girl, able to direct her squad and at the same time do the work herself. Only a few exercises are given, and these the most simple ones which can be given to get results. Interest demands that there be variety, so from time to time the next step in the progression of exercises is added to the list and the less essential ones eliminated. There are always some who cannot be included in these groups. Work is arranged for them by their physician or the teacher. The teacher goes from group to group, and from girl to girl, giving instruction and assistance. Before class or at the close of the hour the class as a whole is called to attention and a variety of work is given; games, rhythm work or general exercises. This affords diversity and interest.

An important feature of the work is its recreational element. Part of every lesson must be pure fun. There

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should be one play day a week. The prevailing sport should be played by those who are equal to it and for the others less strenuous games should be planned. Officials for some of the games may be selected from among those who cannot play the game but enjoy being in the sport.

Follow-up work is a very important part of the teacher's duties. It requires a knowledge of each one of the pupils in the class and the ability to win confidence and to respect it. The teacher must know the various agencies which may be called upon for aid either through the school or outside of it.

RESULTS

Certain records should be available. Improved histories as recorded on health cards, graphs of weight gained (or lost), are desirable. Records of interviews with parents and conferences with girls should be kept. Communications with physicians should be filed with the girl's health record. Improvement in scholastic work because of improvement in health should be noted. Posture tracings, flexible rule records, and photographs all aid in making the record of progress definite. All of these records may not be necessary in all cases, but very definite records should be kept of serious conditions and some records should be kept on all cases. The unfortunate part about the labor of keeping records is that they do not always record. On the cover of one teacher's annual report these lines were written:

These figures are a mask,
For who can tell—
The joy of life,
The freedom of the well
By written word or sign?
A hopeless task is mine,
And these, poor messengers
Of living things.

Besides accumulating these records the teacher should ask herself these questions:

1. Are my pupils more intelligent about themselves than they were a year ago?
2. Have they learned some simple, fundamental facts?
3. Is their attitude toward the work one that will prompt them to carry on throughout the vacation, and after school into life?
4. Have they learned certain schedules accurately for the correction of:

   General poor posture
   Flat feet
   Painful menstruation
   Constipation

5. Have my pupils gained a deeper knowledge of living than one interpreted by the physical alone?

Organization of the Training of Physical Therapists

Thomas Wheeldon, M.D.*

From my best information—although I may be grossly in error—it would appear that the training of physical therapists—in its organization—has been neglected badly. I do not mean by this that physical therapists have not, in the past, been thoroughly trained, and I cannot let this opportunity pass without referring to that remarkable group of women, trained in the office of the late Robert Lovett. To my mind, however, the condition that has ensued upon the death of Dr. Lovett has brought the matter to the crisis which all of us would realize, if we gave the matter mature consideration. By this I mean that the training of Lovett, while being, in my mind, unequalled, was, at the same time, entirely personal. As I understand it, these young women were taken from schools of physical education into Dr. Lovett's office and hand-trained by him and his group. This method, I believe, is still being carried out by his office, which is now headed by Dr. Frank Ober.

At the same time it must be realized that in few other places in the country, probably, could this type of training be equalled. Nor was there anything by which other methods of training could be compared to this, and standardized. To say that one was Lovett or Ober trained meant the ultimate. To say that one was trained by a lesser light might handicap these young women after they had spent a long time in their training, in proportion to the radiance of the man under whose tutelage they had fallen.

Since my earliest training in orthopedic surgery, I have realized the value of physical therapy and the dependence of the orthopedic surgeon upon these trained assistants, and I was not satisfied until definite steps had been taken whereby a standard, organized course for this training could be established, and it is with the question of the organization of the training of physical therapists that I shall deal in this paper.

In pursuit of the idea of a standard organized course, the School of Physical Therapy of the College of William and Mary in Williamsburg, Virginia, has been established under the present plan or lay-out for four years now. It was worked out originally in cooperation with the head of the physical education department of the College of William and Mary, Professor Tucker Jones, of that college. At that time it was felt that this course could be worked into the college curriculum in such a way that a student of physical education might major in physical therapy and receive a degree at the end of four years. This was tried for one year, and because of the brilliance of the students in that particular year, was found to be entirely successful. But during that year it was realized that the students of that year were unusual and that a course resting upon such a basis might not be entirely successful should the students be of a lesser calibre. At the end of that year, therefore, it was decided that the prerequisites for the course should be either a degree from an accredited

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school of physical education (fulfilling all the intercollegiate requirements for a degree), or the sucessful completion for the requirements of a graduate nurse. I shall have a little more to say on the subject of the graduate nurse as material for this course, later. Since that time the standards of the course have been maintained with refinements, each year, of such a nature as to make the course more selective and to improve its effectiveness.

The curriculum of this course is fully outlined in the catalogue of the College of William and Mary. It comprises the following subjects:

	Hours
Anatomy, lecture and dissection	320
Physiology: 54 hours lecture; 68 hours laboratory	122
Physics: 30 hours lecture; 60 hours laboratory	90
Applied anatomy and muscle training: 60 hours lecture; 72 hours practice	132
Pathology and surgical observation: 36 hours lecture; 40 hours observation	76
Massage and corrective exercises: 36 hours lecture; 100 hours practice	136
Orthopedics: 36 hours lecture; 60 hours practice	96
Heat, light, water and mechanical therapy: 36 hours lecture; 54 hours practice	90
Ethics and case work	36
Total semester hour credits	30

The course in anatomy is the course supplied for the medical students and is given with the regular medical students at the Medical College of Virginia. These women are shown no quarter in this course, and should, by any chance, any of them desire to take up medicine, this credit would be accepted by the medical school as completion of this work.

Lectures are given in physical therapy, physics, applied anatomy, pathology, massage and corrective exercises, orthopedics, heat, light, water and mechanical therapy in the Richmond Division of the College. For the present, ethics and case work are given in one of the accredited Richmond hospitals, but it is hoped that in another year the work will be so developed that this part of the course will be given in the Richmond Division of the College. The College is developing a very fine five-year course in nursing and it will not be difficult to arrange this. The special practical work in these subjects is given in our office but the routine laboratory work is carried out in our various orthopedic clinics. (There is no shortage of clinical material for any number of students that we are likely to have at the present time.) As a result of the above plan, my own personal ideas of having these physical therapists well grounded in the basic subjects, followed by a thorough training in all the various branches of physical therapy and polished off in our particular school by an intensive orthopedic training, are accomplished.

I am quite sure that there are those among you and among the staffs of the various hospitals and clinics who would prefer to have physical therapists whose training was more equal in all other medical subjects, or specialties. I agree with you and think that you are right. But for the present there does not seem to be a sufficient number of well trained physical therapists to take care of the orthopedic demands, and as the orthopedic surgeon is at least as dependent upon these workers as any other specialist, I selfishly, probably, feel that they should be supplied first. This is a matter which can easily be adjusted by the introduction of a larger variety of specialists into the training school. I would like to emphasize, however, that I do not admit that the graduates of this school would not be qualified to manage the physical therapy department of a general hospital.

Taking up the problem, as I have thought it out, I think that we must next consider the attitude of the medical profession toward physical therapists so trained. This attitude, I am led to believe, is that physical therapy should become a definite medical specialty and should be left in the hands of physicians. I have tried to analyze this position and am quite sure that this would be an ideal situation. However, being practical minded and having mulled over the problem for at least ten or fifteen years, I am forced to the conviction, personally, that it will be some time before we can leave the problem of the execution of physical therapy to physicians. There are few hospitals or groups over the country, comparatively speaking, that are large enough or interested enough in this particular field to justify a man's becoming so well trained in it that it would become his life work. I do not mean that this condition does not exist anywhere. There are a great many places, where this is possible, but we must think of the hundreds of other places where ethical physical therapy is absolutely demanded, where it would be impossible to provide enough stimulating work to make men of the proper calibre confine their energies to it.

In talking over the matter with a great many physicians, I am also convinced that the average physician thinks of physical therapy as an adjuvant treatment; even, in some cases, to such an extent that physical therapy is used simply when other measures have failed. Anyone who has this viewpoint cannot possibly be fundamentally interested in the subject, and I am afraid it would be carried out mainly by two groups of physicians: first, a group of physicians who were not, otherwise, doing well in their practice and who might use physical therapy as a means of building up their practice; and second, a group of young physicians just starting out, who would use physical therapy honestly until other branches of their practice became of sufficient magnitude to consume most of their time, when their interest in physical therapy would wane and take a rather remote position in their practice.

I am not well enough informed to offer a solution for this problem. I merely hope to be able to talk to the men who are trying to solve the problem that they may see the viewpoint of one who is struggling to establish physical therapy on an ethical basis in pioneer country, of which I am sure there are a great many sections in the United States.

We are all certainly aware of the fact that the various cults have definitely thrived and developed upon the obvious need of physical therapy, and unless we can offer something concrete, these cults will continue to exist. It seems, therefore, that it is up to those of us who are interested in physical therapy to offer something definite in the training of ethical physical therapists.

This brings me to the point that is probably nearest your heart. Certainly there are two groups to be considered from which material is to be drawn: those persons who have had adequate training in physical education, and graduate nurses. It would seem, at casual glance, that the graduate nurse would be the ideal person to assume this responsibility. I think this is mainly because of her medical knowledge. However, when you consider a curriculum such as that laid out let us say, for instance, by the college of which I have been speak-

ing, you will see that the training of the graduate nurse is inadequate in every subject, and that her previous training, except from a practical standpoint, gives her very little advantage.

In contradistinction to this are those who are trained in physical education. The courses of physical education require cultural courses, including English and literature, social science and the biological and physical sciences. They require professional courses of education, health and physical education, and certain electives, such as the appreciation of music, play production, art structure, educational sociology and child development. If these courses as laid out in the catalogue of the College of William and Mary are analyzed, it is easily seen that not only do the basic courses give the physical therapist a mental training such as to make her more capable of absorbing advancement in the various sciences, but in addition it is seen that the professional courses are definitely directed toward training the physical therapist in the practical application of what has been learned in the more advanced course in physical therapy. For example, such courses as the principles of elementary science, with educational psychology and supervised teaching and observation certainly enable the physical therapist to instruct the patient in the proper execution of the various procedures. It seems to me that a course such as educational philosophy without doubt brings the physical therapists to a better understanding of the patient, and such courses as the testing and measurement of muscle power more easily enable her to evaluate the mechanism with which she must deal. In addition to this, I have been struck very forcibly with the relationship of the physical therapeutic procedure to the activity found in the various forms of dancing and games. And there is no doubt that the sound principles of therapeutic gymnastics and massage taught the student of physical education are much more thorough than that type of the same procedure taught the average undergraduate nurse.

As a matter of fact, I have been struck, in talking to a good many of the instructors in physical education, with their keen sense of the mechanics of the body, and adding a medical knowledge, how easy it would be for these individuals to take over and probably solve problems which are frequently difficult even for the average physician.

As a test, I have actually asked physical education instructors to tell me, theoretically, what procedures they would carry out in the reduction of certain dislocations and fractures, applying their training alone, and it has been quite startling to realize how accurately their suggestions coincided with the proper physiological handling of such conditions. This comparison could easily be carried on through practically all of the branches of medicine.

Physical therapy has been practiced for a good many centuries. Massage and movement have been used by all races in all ages, and I believe, if I am correct, that Hippocrates, in speaking of the effect of massage, said that hard rubbing binds, soft rubbing loosens, that much rubbing causes a part to waste and that moderate rubbing makes it grow. I only quote this saying to emphasize a point. We are not interested today in a new field. We are interested in organizing a specialty which has proved its value in such a way that it will become entirely ethical and take its place alongside other professions. This can be done if we stick closely to our principles—that to become a physical therapist one certainly should have an accepted education of a general nature, should understand the principles of physical education, possibly supplemented by a training in nursing, and then have a post-graduate period in which the subjects most specifically associated with physical therapy are thoroughly stressed. It will be impossible to interest large numbers in taking such extensive training, but by making a slow beginning and turning our products of such stellar quality that they will be accepted with open arms among the medical profession, we can so establish ourselves that the patients will avoid those trained only in cults and seek the ethical medical offices, where well-trained physical therapists are known to be employed.

Muscle Re-Education After Poliomyelitis

May Goodall Darrow*

In view of the increasing necessity for muscle re-education after the many disabilities which the physical therapist is called upon to handle, it is well to review the fundamentals in the intelligent approach to the work.

Observation of the weaknesses and inadequate results obtained in such cases from past endeavors with old methods, should give the clues for better work—work that brings inspiration and results. Take, for instance, an old polio case, and check up results. Usually it is found that heavy braces have been dragged round by means of a throwing movement of the hips, the chief pull falling upon the sacral region and lower spine, which, in spite of braces, has pulled the sacrum almost into a horizontal position and resulted in deplorable weakness of the spinal controls. Muscular examination will probably disclose considerable power in the main groups but of inadequate strength to lift and move the limbs. Long bracing has atrophied the muscles and thrown the stresses upon very limited controls, usually the harmful backward-upward action of the gluteals. Shoulders have probably been pushed up by crutches (often out-grown), and the weight of the whole body allowed to sag forward with loose wobbly spine—the case comes to a standstill much to the discouragement of all concerned!

It is glaringly apparent that the whole structure is wanting in central control and strength; this is the clue to the whole situation. The best, in fact, the only satisfactory pulley and leverage power must start from fixed points or fulcrums, with the supporting structure in alignment, in any mechanism, and this is particularly true in a movable structure controlled by the balance and interplay of muscle action, as it takes place in the body.

IMPORTANCE OF SPINAL CONTROL AND STRENGTH

It is a matter of the gravest concern that the conscious control of the spinal erectors has been quite overlooked, and even in the ordinary individual there is a

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state of inactivity of these important groups, which leads to rigidity and stiffness as the compensatory curves "settle." Circulation of the spinal fluids are retarded, or of low potential, and the power to support the stresses becomes rapidly depreciated and the whole region becomes a fertile ground for contractures and arthritic deposits, while the many structures dependent upon the spine sag out of alignment.

By spinal erectors it must be remembered that the groups of balancing muscles on the front of the spine, in the hip, waist, and neck regions, are of the first importance. These muscles, fortunately, are not usually affected by the paralysis itself, though they lie more or less in a state of inactivity and uselessness, like old sagging elastic deteriorated through disuse. It is not an exaggeration to state that discovery of these muscles and gaining control and strength of them, gives a power and feeling of wellbeing, which at once uplifts the whole morale of the patient, and is the key to the whole situation.

Begin to rebuild, then, by developing the deep hip flexors and the gluteii or "guy-ropes" of the hips, by means of the strong downward contraction of the gluteii from the origin above and the action below. As this control is gained to a degree, then build out and backward upon the lumbar region, then continue up the spine with control on the lower chest and neck as each region in turn can be definitely built out by muscle power, as explained in a previous article in the "Review" of July-August (See "Posture Up to Date" article.)

The Diagram shows that the spinal supports are provided close to the bony structure and are intended to bear the stresses and strains near to the line of equilibrium not dependent upon abdominal walls, shoulder, etc.

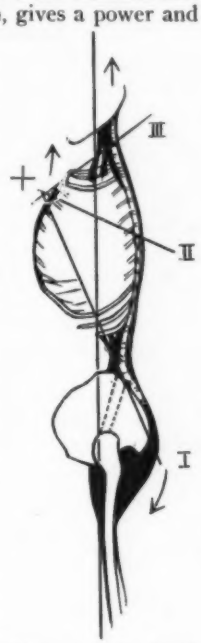

Diagram of the imaginary scaffolding of the body structure, showing the principal stress points at I, II, III and the muscle groups provided to balance these strains. The point of antagonistic resistance is marked X and is fortunately the same for all three stress points. Note the removal of the shoulder girdle as this has no direct influence upon the fundamental spine controls.

BEGINNING WORK WITH POLIO CASES

After the pain has subsided, and treatment is prescribed, begin to gain the body control, as described in the above mentioned article, using first the movements in the lying position, after heat is applied if possible. For instance: use carefully the following types of exercises:

Lying Position: Flatten back against the bed and draw down the buttock muscles, slowly, holding the position a few counts, then release. This is the fundamental position.

Add—Push down on the heels and up with the head.
Add—Single hip raising—shoulders flat and limbs relaxed—get a cork-screw twist in the side abdominals.
Add—Rotation outward and inward of the whole leg with control in the hip region only.
Add—Shrugging of the hip upwards.
Add—Knee bending (when ready).
Add—All-fours position, "Cat's back."
Add—Rolling over.
Add—Neck exercises.

Keep to this work for some time, often for many weeks. Great judgment is required to avoid exhaustion, but the feeling of fatigue will wear off as the different functions of circulation and respiration are correlated.

When the spinal controls are mastered in the recumbent position, they can be very gradually carried into work in the sitting position, *but must never be forgotten,* as they are fundamental and of the greatest protection to the spine, as well as being the best means of stimulating better function in the whole body—the spine being the switch-board of the body.

Leg and Foot exercises in the lying and sitting positions should be practised for a long time before taking the weight incidence.

BALANCE

With the basic control obtained at the back of the body instead of at the front, the method with which we have labored so long with poor results, it becomes safer to allow weight carrying, always with support where necessary. As faulty position and weakness are usually the main difficulty in paralysis of the lower limbs, it is often best to postpone weight bearing for a long time.

SYNERGISTS

Too little attention has been given to the influence of the synergists, or supporting muscles, which cooperate to such advantage in every movement of the body, and help so much in the holding power which should protect the position of the joints. For instance, note how the thigh muscles sag outward while the outer contour of the thigh bulges causing the knees to incline inward followed by the inward roll of the ankle. Much can be done to get these muscles into tone by movements in the lying position, for the body structure must be kept in alignment. Also in equilibrium.

When once it is understood and experienced that the strong, straight, well-controlled spine is literally the backbone of the body upon which the successful action of every other part depends, and from which the various powers should coordinate, and that the hip control is the basis of balance, improvement is at once noted in the position and use of the lower extremities.

Note how the four-footed animal pricks up his ears, erects the neck, pulls down the haunches, activates the spine with reflex contraction of the side-abdominals as well as the abdominals, while at the same time the leg muscles become taut, ready for the spring forward, and if the animal is sufficiently excited, he will stand erect on the hind legs using all controls from the back. Compare the rigid, inelastic, effort of the boy who pushes back hips and shoulders, chin up with curved neck, knees pushed back to hyperextended position, the whole structure out of plumb and out of gear because of wrong alignment and balance.

DISABILITY OF THE UPPER EXTREMITY

The same principle applies to the approach to arm cases, that is, gain power and control of the base or anchorage of the arm before expecting results with the rest of the arm and hand. The shoulder must be freed and strengthened, independently, by localized action upon

the shoulder-blade muscles, deltoid, and neck groups. Eliminate the weight of the arm entirely at first. This can be done even in an air-plane splint to great advantage, or with the arm supported in various ways. Work for contraction of the lower fibres of the trapezius, rhombodeii, and all the intra-scapula group which serve to overcome the pull of the serratus magnus as it pulls the scapula forward (a muscle whose insiduous influence is usually overlooked).

When the shoulder is freed and strengthened and brought into position—it is often dropped into a low position, as is also the case with the hip—it will be found that much greater progress will be made with the arm and hand. The smaller movements will respond but as these require much greater nerve control they will take longer, but can be helped by the synergists.

Use these same fundamentals with old spastic cases. Give the instigation to big muscle activity instead of continually nagging at the child to "stretch out the fingers" —the fingers will be much more likely to relax and stretch out after using pushing, pulling, punching, shaking, and light wrestling movements, when the seemingly impossible movements will be gained. Encourage hand play (Peas porridge hot), pushing an iron (cold), and even bar work and games, and give these long suffering cases some fun and instigation to progress. We have been too timid and had too little faith in the possibility of progress in these cases, and in old polio cases, in the past. Exercises in the water should be followed up with these types of movement, for as the child cannot live in the water, it is necessary to make the gain permanent. Too often these cases are content to sit still and do little when out of the water.

CONCLUSIONS

In work of reconstruction it is necessary to get spinal control first and last, for it is by correlated movements from strong centers that the kinesthetic sense is developed. Not only is the muscular balance coordinated, but the flexibility of the spine will stimulate better function which should help in reconstruction of the weak parts.

Work for muscle power in the large groups before expecting control of the smaller, leave the limbs until later.

Study the action and development of the supporting muscles as protectors to hold joints in position, to prevent sagging.

Work for an objective and have faith in accomplishment.

Prevent monotony by constant stimulation to fresh endeavor instead of constant repetition of the same program. Think how deadening to any line of endeavor!

In old cases require constant and considerable progress and do not be content with poor effort. Encourage the patient to keep a record of the number of times exercises are repeated—up to fifty or more. Remember that it is necessary to bring muscle fibres into play in relays and that fifty per cent of these must be used before any development can be expected. It is estimated that the average muscular exertion requires only seven per cent. We have been too timid.

Discover the many good assets. Bring a little fun and enjoyment into the lives of these handicapped children, and never cease to progress. Too often the child is left too many hours in braces. Much work should be done in the recumbent position with braces off. Have confidence in results and possibilities.

Improvement in the Mechanics of Muscular Performance

By the Use of Bandages for Constriction and Fixation

Ruth Aust

In dealing with patients suffering from the effects of anterior poliomyelitis, it was found that firm pressure against the contracting fibers of the affected muscles permitted the patient to feel either the bulging pressure of contraction, or the cessation of pressure on relaxation of the muscle. The statement was made frequently by these patients that they localized the muscular contractions better and that the muscle seemed stronger if pressure was applied to the bulging muscular fibers. Some patients noted contractions in the most flaccid sections of fibers—those most difficult to find when pressure was not applied; they had less fatigue, greater speed in movement, and definite increase in power. These findings led us to use bandages, as described below, to obtain a wider field and more expansive pressure.

By the use of various types of bandaging, we found that: (1) the bellies of the protected muscles frequently increased in girth; (2) the movements resulted in more efficient action upon the joint; (3) the onset of fatigue was postponed.

Though we can offer no definite explanation for the clinical results achieved, it seems reasonable to suppose that both mechanical and psychological factors enter into such results.

From the mechanical standpoint it appeared that the bandage was substituting artificially the function of the fascia of the muscle. The value of fascial sheaths on the efficiency of the action of muscles was investigated, but very little discussion was found in the literature. The following facts, however, pertaining to the increase of power and speed in the action of muscles seem pertinent:

(a) The bulge (cross section) of a muscle increases in direct ratio to the increase in the load placed upon that muscle.

(b) More muscle fibers are brought into play as the load on the muscle increases.

(c) The speed of contraction of a muscle is most rapid when tension is attained at the time of greatest

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stimulus. In other words, muscle contracts in response to the "stretch reflex," but over-stretched muscle fibers cannot contract at the usual rate of speed. This lag results from the fact that the normal tension is lacking.

(d) Tension can be increased by sensory stimuli arising in the muscle itself. Pressure is essential to this mechanical stimulation.

Correlating these findings with our observations, it seems to us that the constriction against the stronger section of the muscle increases the load, causes a reduction in the stretch of the more atrophic fibers, and therefore an increase in tension and greater efficiency in the muscle. Stimuli which are mechanically irritating to the muscle fibers presumably are called into action.

From the psychological aspect, the tactile sensations of the pressure of the belly of the muscle against the bandage help the patient to localize the effort and give him more satisfaction.

The purpose of applying the bandages is twofold: first, constriction around the muscles, and second, fixation involving both muscles and joints.

For the constriction of muscles such as the quadriceps, spiral bandages were applied around the leg extending as nearly as possible over the length of the muscle, care being taken not to interfere with circulation. The same method was used over other long muscles such as the biceps. For paralysis of the abdominal muscles, the trunk was encircled with a bandage extending from the anterior superior spinous processes of the ilia to the margins of the ribs. Abdominal aprons made of canvas with adjustable straps which could be tightened, were successful if the pads were large enough.

It has been found that the long muscles with relatively short tendons respond more successfully to bandaging. If the antagonistic muscles are relatively much stronger than the paralyzed ones, this type of bandage is decidedly a handicap, as the stronger muscles are benefited instead of the weaker, probably because of the expansion of their bellies. Stocky and obese patients profited most from these circular bandages. However, this observation is based on the treatment of too limited a number of patients to justify generalization.

Fixation of muscles and joints applies particularly to the shoulder and hip. When the gluteus medius muscle is weak, a figure-of-eight bandage is applied around the leg, crossing the gluteus medius and encircling the waist. This is repeated until the leg is fixed to the pelvis. For the gluteus maximus, the crossing takes place over the posterior surface of the hip. When the rhomboid or trapezius muscles are affected, the bandage is applied around the shoulder joint, encircling the chest, and around the opposite shoulder (to prevent sliding). This is repeated, with the greatest protection directed over the desired area.

These joint bandages fix the muscles in such a manner that an extreme stretch is impossible and, at the same time, resistance to the bulge of the contracting muscles may be felt.

The following case reports indicate the improvement noted in a relatively short time by the use of these bandages whether at home or during treatment.

Case I.—R. H., male, twenty-one years old, had had residual paralysis for four years, following acute anterior poliomyelitis. One arm was flaccid, the other was involved throughout, with the biceps able to contract against gravity, but not against resistance. After two months of muscle training, with the biceps bandaged all the time, the muscle returned to almost normal power.

Case II.—M. A., female, aged thirty-seven years, had acute anterior poliomyelitis at the age of thirty years, with residual paralysis. For the entire seven years of disability she had worn proper braces and had been trained in muscular control, including two years of training in a therapeutic pool. On admission, however, she was unable to stand in neck-deep water. After one month of muscle training with an abdominal apron, she was able to walk in water at axillary depth and to climb stairs until she was in water only waist-deep.

Case III.—B. D., male, eleven years of age, had residual paralysis of six months' duration, following anterior poliomyelitis. Muscle training had been given after the first month. At the end of the fifth month the scapulae adductor muscles were protected by the bandages and muscle training was continued. After one month of such bandaging, the rhomboid muscles graded "good" as against "poor" at the beginning of training.

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Scientific and Practical Aspects of Massage

C. G. A. Biörkman, M.D.

Massage supersedes in antiquity all other forms of therapy, drug as well as physical. The surgeon general of the United States Army has aptly said: "Massage began when earliest man rubbed his bruises." A remedy of so remote an origin, used in some form or another by all people, in all climes, becomes finally part of every man's household weapons against disease, and usually suffers neglect by the fastidious hand of modern medical science. I believe that the modern general practitioners as well as specialists in physical therapy are neglectful of massage both as to its scientific aspects and its practical importance. If I can revive a little scientific interest in this old remedy, it will be to our mutual benefit, I hope.

The scientific side of massage is, until very recently, poorly represented in the annals of medical history. It is true that the dimly-lit pages of ancient and medieval medicine are occasionally brightened by the fact that every medical genius throughout the ages has shed some light on the subject of mechano-therapy.

Almost five thousand years before our day, the Chinese philosopher, Kong-Fu, left a record of respiratory exercises and manipulations, and 1800 years B. C. the Yoga cult in India used respiratory exercises for religious and healing purposes as recorded in the Veda books of wisdom. Egyptians, Persians, and above all

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the ancient Greeks, Herodikos and Hippocrates, have left behind them prescriptions for massage and exercises. There is in the Berlin museum a two-thousand-year-old alabaster relief from the palace of the Assyrian potentate, San Herib, which depicts a massage treatment as realistically as seen in our clinics today.

The pathfinders of ancient medicine were almost forgotten during the Middle Ages, and it is not until Ambroise Paré in the sixteenth century of our time that we find the scent taken up again, and an anatomical and physiological foundation for mechano-therapy sought for.

From then on, much, both good and bad, was written on this subject, but nothing was actually done for mechano-therapy as a scientific discipline until the beginning of the last century, when medical gymnastics and massage took on new life through Per Henrik Ling of Sweden, the founder of the Central Gymnastic Institute at Stockholm. During the last century thousands of students have graduated from that Swedish institution and have spread the knowledge of massage and medical gymnastics to the four corners of the world.

The so-called "Swedish Movements" consisted of massage and medical gymnastics without distinction between the two, often combining both in a simultaneous application on the theory that massage is a form of passive gymnastics. The difference in physiological values between massage and exercise has been cleared up by modern researchers, notably by Pemberton and his coworkers in America. Exercise, however performed, causes metabolic changes not met with in massage. Even very slight exercise produces an increase of lactic acid products in the muscle masses involved, and the pH of the blood is altered by exercise but not by massage. Changes in metabolic processes as a direct result of massage are probably negligible.

EFFECTS OF MASSAGE

Pemberton, Cajori and Crouter have shown by their experiments that massage leaves no such effect as acidosis due to excessive exercise, or alkalosis due to prolonged exposure to heat. The slight diuresis following massage of healthy persons may perhaps be of value in some pathological conditions as also may be the increased output of nitrogen as noted by Cuthbertson, but we are not certain. The claims for massage must forever be empirical. It behooves us, nevertheless, to inquire into this empiricism, and discard many untenable claims. We cannot deny visible and palpable improvement following the exhibition of massage in certain well-defined pathological conditions, for example in traumatic swellings. However, the physiological basis for effects of judiciously applied massage is a question that still remains unanswered.

It is evident that many authorities on massage have had quite a difficulty in explaining the results reached by this form of therapy and therefore many different virtues have been ascribed to the various massage movements. The most common assumption is that massage causes acceleration of the circulation through mechanical propulsion of the blood and lymph, and of the resorption rate of inflammatory deposits. To prove this, von Mosengeil demonstrated sometime in the eighties, an ingenious experiment consisting of an elastic rubber tube fastened obliquely to a board in such a manner that when the lower end of the tube was placed in a basin of water, continuous stroking on the tube would cause the fluid to be sucked up against gravity. This experiment coupled with the observation of the visible emptying of the superficial veins in the human arm by continuous centripetal stroking was accepted for many years as proof of this theory.

Another related theory assumes that massage quantatively increases the blood in any part of the body exposed to its action. This presupposes a mechanical congestion of blood in a limb somewhat on the order of Bier's hyperemia. But, if an unmassaged arm is first immersed in a suitable measuring glass filled with water and the displacement level marked, it should follow that an increase of even a few cubic centimeters of blood in the limb following massage will displace more water than before massage.

No evidence has corroborated this theory of congestion, and the practical application of von Mosengeil's experiment is only apparently correct, since it does not explain the fact that the veins do not refill in the same tempo as they are emptied by centripetal stroking. On the contrary, after a few repetitions of stroking, the veins refill more and more slowly, and after a while it will take longer and longer intervals until the veins bulge as before massage. If the venous blood stream was actually accelerated, the refilling of the vessels would take place at the same rate as the emptying. The theory presupposes a suction action of the veins, but the absence of Henle's tunica elastica in the veins makes suction impossible. It is therefore fallacious to think that massage will act like an alternating suction pump on the veins as it did in the rubber tube in von Mosengeil's experiment. This pertains in equal degree to the lymph vessels since they also lack in elastic elements. Such elasticity and consequent suction power may be present in the arterial vessels, but they do not come in for any direct influence of massage. It is to be remembered, too, that the pulse rate is not noticeably affected by massage. This holds good for the blood pressure as well.

The theory of accelerated resorption of inflammatory deposits due to the mechanical emptying of large veins and lymph vessels by massage is likewise untenable. Even if it could be accepted as a fact that massage does cause acceleration of the circulation, it could only do so during the treatments. How is it then to be explained that evidence of circulatory improvement is doubtlessly present long after the cessation of massage? For example, twenty minutes of massage on a traumatic ecchymosis causes improvement lasting for days. It is also pertinent to recall that a pleural exudate of long duration often starts towards complete resorption from a single thoracentesis producing relatively little drainage. Neither can be explained as mechanical phenomena.

Since it is impossible to remove by any kind of massage an edema caused by renal or cardiac insufficiency, it may be accepted that actual improvement in the resorption rate by massage in other pathological conditions is not due to the mechanical emptying of veins and lymph vessels. That the effect on resorption, whatever its mechanism, is sometimes quite opposite, can be seen in the different swellings resulting from trauma and from acute inflammation. The first is benefited by massage, the latter is decidedly made worse thereby.

The effect of massage on the nervous system has likewise been exposed to much speculation. Pfluger-Arndt's law has been used as explanation of favorable results observed by nerve friction. This law of nerve reaction decrees that a very weak stimulus starts reaction, a moderate one increases it, a strong one blunts it, and the strongest stimulus inhibits reaction entirely. In practice, massage does not follow this law but works just the opposite way, as is observed with Champion-

niere's light effleurage inhibiting pain as severe as that of a recent fracture, and the Swedish tapotement which increases sensibility under any and all conditions.

EXPLANATION OF MASSAGE

In the last decade a new theory, first proposed by Rosenthal and further elucidated by Pemberton, holds that massage mobilizes erythrocytes stagnated in the capillary network of the body. The improvement of the blood picture following so-called abdominal massage was observed by Kleen, of Sweden, almost fifty years ago. This theory is of far-reaching value and opens up new fields for the application of massage, especially in those of the anemias in which new erythrocytes are needed to combat lagging processes of oxidation. This is a theory founded on facts easily verified by a blood count, but it does not tell the whole story.

A rational explanation for the good results of massage must be sought for outside the laboratory, because massage on healthy individuals or animals can give us no help in our quest. The effects of massage can only be measured visually and palpably in the rheumatic patient, and from clinical observations the following conclusions can be drawn:

The technic of massage makes use of the following manual operations, viz.: effleurage, friction, petrissage, vibration, and tapotement. The difference of effect by these various manipulations is one only of degree. They all give rise to the same reaction when applied to a rheumatic muscle: pain and a specific reaction of contraction. Light effleurage to a subacute condition produces light sensation and little contraction, while heavy petrissage to an acutely rheumatic muscle gives rise to severe reactions.

Different methods which produce the same reactions must themselves be of a similar nature, and the different manipulations in massage have this in common, that they produce a transient squeezing of the tissues from two sides, be it between the fingers of the operator or between the operator's hand and the underlying bony structures of the patient. Thus the lightest effleurage and petrissage are forms of transient pressure just as friction, vibration and tapotement are forms of prolonged, temporary pressure.

In the rheumatic picture we have two constant features: pain on pressure, and increased tension or hypertonicity. These two cardinal symptoms are the norm by which the effect of massage can be measured. The oftener the massage is exhibited, the sooner the pressure pain and the muscular hypertonicity decrease. This improvement is functional in nature and due to a general decrease of the hypersensitivity and hypertonicity of the rheumatic tissue explainable by the law of nerve fatigue but not by that of Pfluger-Arndt.

The muscle is the tissue par preference influenced by massage, and the effect thereof is both functional and anatomical, and depends entirely upon the squeezing or pressure exerted on the contractile substance of the muscle cell. This effect of massage secondarily affects blood and lymph vessels and their fluids, as is seen in the improvement of saphenous varicosities after proper massage treatment of flaccid calf muscles. Resorption of inflammatory exudates and organized fibrinous deposits are consequently influenced.

Non-muscular organs, like the articulations, synovia and tendon sheaths, are influenced by massage to a lesser but not unimportant degree. Periosteum is very little, if at all influenced by massage, except that pressure pain is evidently relieved in traumatic periostitis. Great increase in callus formation has been observed by massage in bone injuries in children, which may be due to stimulation or irritation of the osteoclastic layer of the periosteum.

Fatty tissue is never influenced by massage, but its underlying muscular elements may improve with consequent changes in the contour of the adiposity. The idea emanating from reducing parlors that fatty tissue can be "rubbed off" is of course absurd. The skin is favorably influenced by massage because of its underlying muscular elements.

Contrary to common belief, nerve tissue itself is not changed by massage, anatomically or physiologically. I have never seen a paralyzed motor nerve rehabilitated by massage. Functional improvement of a motor nerve is only observed when its paretic muscle is restored to normal by physiologic rest and massage. If the hypertonicity of a rheumatic muscle is decreased, then the irritability of its sensory nerve decreases as well. The common diagnosis of neuritis is erroneous, because there has never been demonstrated any histological changes in the nerve itself while palpable changes in its surrounding tissues are common. Proper myologic treatment cures most of the so-called neuralgias and neuritides. True neuritis due to avitaminosis or specific nerve poisons or to disease of the central nervous system, is, of course, excluded in this argument.

Empirically as well as experimentally we know that the blood and lymph circulation is dependent on normal function and condition of the musculature and that diseased muscles will produce disturbances of the circulation. When massage restores the diseased muscles, improvement in circulation will follow, not only in the extremities, but also in the center of circulation, the heart itself.

One can reach no other conclusion than that massage is above all a treatment of muscle tissue and should be prescribed from that point of view. If we think of massage as a muscle therapy and not as same sort of pumping machinery, it might be possible to remove the stigma justly fastened on physical therapy by Dr. C. R. Murray at our congress in New York last year. He told us that the average disability from fractures of the leg amounted to nine months during a ten-year period of analysis. Haphazard application of intense baking, static and diathermic electricity are responsible for the prolonged disability complained of by him. It is the surgeon's fault if any massage at all has to be used in recent fractures. It is actually harmful as Bohlar has proved beyond doubt. So long as surgeons and physicians decline to interest themselves in the training of masseurs, that long will massage show poor results and physical therapy in general will have much to atone for.

SUMMARY

Massage, then, is not a miraculous cure-all, but a remedy which can be advantageously applied to a multitude of conditions. Its chief value lies in its unfailing effect on hypersensitivity and hypertonicity of the motor engines of the body and its secondary influence on circulation and resorption.

The muscular system accounts for fifty per cent of our body weight and most of our bodily discomforts are manifested in the muscles. We have therefore in massage a remedy of almost universal application, since only excruciating pain and acute inflammation contraindicate its use. Why should we then frown upon the more or less empirical grounds upon which we must prescribe it?

And why should we pass up such an excellent chance to improve our economic situation as by having a well-trained masseuse in every doctor's office?

It cannot be expected that every doctor should be an expert masseur, but he should know the fundamentals of massage and what to expect of it. A properly trained masseuse can easily hold many patients in close contact with the office six times a week instead of about once a month. Every patient expects that something should be done to allay his discomfort and, while the doctor studies the case and necessary laboratory and other investigations are under way, something good can actually be done for the waiting patient by routinely exhibiting massage. It is improper to send patients to an independently practicing technician. One risks losing patients because the technician gives that personal attention which the patient expected from his doctor. It is suicidal to say to a patient with a pain in the back, "go to so and so and get a good baking and massage." Such care should be afforded in the doctor's office, right then and there, and under proper supervision. There are cases of backstrain due to French heels, to a sacro-iliac sprain, or to partial refrigeration of the body. An independently practicing technician might differentiate between the three conditions and perhaps give the right treatment, but in any case, the patient would be gone anyhow and would never return because the patient would think that the masseuse knew more than the doctor. Therefore we should make more use of massage in our own offices and under our own personal control.

Treatment of Birth-Injured Children

Elizabeth C. Addoms*

In an address given before the Convention of the American Physical Education Association, April, 1933, Dr. Earl R. Carlson, of the Neurological Institute of New York, gave an account of the nature of injuries received at birth. The address, printed in the *Journal of Health and Physical Education,* January, 1934, describes causes and symptoms, stresses the psychological aspect of the abnormal condition, and recommends an educational procedure for patients thus afflicted. The present article aims to outline in more detail an actual program for such children.

If results of examination indicate that the disease is non-progressive and the mentality normal, the case may reasonably be considered amenable to treatment. The child should be tested to determine whether any other untoward condition than the birth injury disturbance exists—for example, infected tonsils or adenoids, glandular unbalance, eye and ear disorders. If there is a speech difficulty, its exact cause should be determined. In instances of sight, hearing, and certain speech defects, placement of the individual in a suitable educational environment may be important.

When admitted for treatment, the boy or girl should enter a friendly, happy, but business-like atmosphere. An attitude of quiet poise in the instructor is essential to the patient's progress.

To procure an intelligent response from the child of school age, some time should be taken to give him an elementary understanding of his body as a mechanical structure to which the same principles of balance may be applied as to any inanimate structure. From an explanation made in simple language he should acquire a clear concept of his body framework in the poised erect position—"the three major weights—the head, the rib-cage, and the pelvis centered directly over each other; the head balanced on the top vertebra of the spine on a line with the lobes of the ears; the spine running down in four shallow curves to the strong supporting pelvis; the pelvis balanced on the heads of the upper leg bones; the upper leg bones resting on the lower leg bones and the feet forming arched supports at the base; the shoulders hanging from the muscles of the head and upper spine, and the ribs from their vertebral attachments."[1] In this balanced posture the bony framework bears most of the body weight leaving a minimum of strain on muscles and ligaments. An invaluable booklet in this connection, written for the layman with little or no understanding of anatomy is *First Principles of Body Balance,* by Mabel Elsworth Todd, illustrated by Victor Perard. Though elementary in presentation it is sound in mechanics.

Next, a brief explanation of the muscular system should be made so that the child may, to some extent, visualize individual and group muscle actions; and, lastly, he should be told, in terms comprehensible to him, what is the cause of his present disability and what he must do to improve his condition. He should understand that progress will be slow but that it will be sure if he perseveres over a long period of time, that it will not be easy, that self-discipline will be required, but that the result should be worth the effort. The instructor should instill as great hope for recovery as is reasonably justified, but care must be taken not to exaggerate in this respect, thus causing future disappointment and discouragement. The reader will understand that the information outlined above must be adapted in its presentation to the age and development of the individual.

The types of disturbance arising from birth injuries are numerous. For example, we find spasticity ranging from slight muscular hypertonicity to the more complex condition in which affected parts assume fixed positions due to uneven distribution of tonus; or there may be rigidity resulting from simultaneous strong contraction of antagonistic muscle groups. A type of involuntary movement known as athetosis may frequently be observed also—or irregular, jerky movements characteristic of chorea. Tremor sometimes occurs. Then there is the class of cerebellar ataxic disorders showing unsteadiness in performing voluntary movements, lack of equilibrium in standing and walking, and hypotonus of muscles. Here the sense of sight must be capitalized for maintenance of balance. In many cases there exists an interference with affective tone causing an overload-

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1. Mabel Elsworth Todd, First Principles of Body Balance, Mabel Elsworth Todd Studios, 160 Central Park South, New York City.

ing of sensation with emotion. The above clinical symptoms seldom exist singly but in varying combinations, due to the location and extent of the area involved.

Although treatment must obviously be entirely individual, the objective is always to establish correct dynamic patterns in the birth-injured child. Because of the characteristic nervous excitability of spastic patients, stimulation should be kept at a minimum in treating these cases. For this reason too much talking on the part of instructor or patient during treatments results in an unsatisfactory response. For the same reason heavy massage is contraindicated. Treatments are usually best begun by allowing a few moments in which the patient is asked to lie as quietly and as completely relaxed as possible. During this time, as in executing purposeful movements later, he should be consciously trying to loosen tight muscles and yet not thinking solely of this, since such concentrated effort inevitably causes increased contraction of already spastic muscle groups. Muscle education, the underlying principles of which are familiar to physical educators, follows. However, a few points especially applicable to the training of birth-injured children should be made. The primary aim is to develop voluntary control of muscles through their balanced activity. Therefore, slow, rhythmic coordinations, graded from simple to complex are recommended. The employment of quiet music with a slow but regular beat is frequently of great assistance. Likewise the recitation of poetry may prove beneficial from the standpoint of relaxation and rhythm. Localization of movement to the part or parts intentionally being used should constantly be emphasized. Exercise should be active or, if necessary, assistive. Passive exercise should be used only for very slight rhythmic stretching of contracted muscle groups when antagonists have been relaxed. Exercises in which a little resistance is offered are in order but the child should not be urged to exert undue strength in overcoming the resistance. Because of the elimination of gravity load from joints, due to the buoyant effect of water, pool treatments prove distinctly beneficial to some patients. The water should be reasonably hot and great care must be taken to avoid fatigue.

The boy or girl should strive to cultivate a memory of muscular sensations, to recall the difference in feeling between tension and relaxation. This is of real importance and is, therefore, worth a considerable expenditure of time and thought. In giving directions the instructor will elicit a better response by using verbs that convey a concept of the result he purposes to attain—for example, "soften" or "loosen" is more significant than "relax." Likewise "stretch" is preferable to "reach" since the former word involves in greater degree a concept of the action itself, the latter of the end to be accomplished.

Negative commands should be avoided since they form a picture in the patient's mind of a condition that is undesirable. Surprisingly good results often come by appeal to the youngster's imagination. Such suggestions as "feel soft—like a kitten"; "make this muscle feel like molasses"; "feel as if you were melting"; "feel heavy —like a bag of flour"; and "feel as if you were sinking down into the mattress," almost always aid in producing relaxation. Similarly telling a child who habitually holds his shoulder girdle in a high, fixed position to imagine as he walks that there is a lead weight hanging from each elbow, will cause release of tension throughout his whole body as the shoulders drop to their natural level. Of course, muscle education should proceed from the larger groups to decreasingly smaller ones with constant emphasis upon conservation of energy in movement.

It is important that the child learn to sit as soon as possible since the attainment of this posture opens new avenues of development both mental and physical. Distribution of the body weight evenly on both tuberosities should be stressed. Failure to observe that weight is being borne mainly on one side may result in development of a contracture and lateral deviation of the spine that might have been avoided. Likewise when the patient is learning to stand and walk he should be cautioned to place equal weight on both feet. Walking on parallel lines proves of value in some cases as does practice before a mirror.

For teaching writing, a blackboard set on an easel is an invaluable asset. Obviously emphasis should be placed on relaxation of shoulder girdle, arm, and hand muscles. At the start, large, free movements are desirable. Later, when desk writing is begun, movements should be made largely upon the "fat muscle" of the fore arm, lessening tension in the fingers to a greater extent. With the spine extended, both arms should rest easily on the desk but the child should not lean upon them. In this position one hand steadies and guides the paper while the other writes; and there is no reason for turning the head.

A sound psychological approach in dealing with birth-injured children is of paramount importance, since as a group they are extremely sensitive. The instructor should make the treatment as interesting as possible without allowing it to degenerate into a play period with the child commanding the situation. The patient should be provided with some opportunities for complete success so that he may enjoy the sense of accomplishment and thus be stimulated to further endeavor. He must learn to accept deserved praise and adverse criticism calmly and graciously.

Home cooperation is essential. The general program outlined by doctor and instructor should be adhered to faithfully if best results are to be obtained. At least two half-hour periods daily, either at home or at the school or hospital, should be devoted to treatments, each of these being followed by a rest period. Activities involving some accuracy of movement—for example, the game of ring toss and clay modeling—are recommended. Likewise sports requiring rhythmic movement—as swimming, tennis, golf, and bowling—are beneficial to boys and girls who are able to engage in them. The child's education, academic and otherwise, positively must not be neglected. In a quiet atmosphere, he should be kept busy but not rushed throughout the day. If he succeeds in cultivating broad interests and an objective point of view, he will avoid the sinister habit of brooding upon his own physical ineptitude and consequently turning his energies inward. He must of course learn to realize his limitations and strive to develop his potentialities to the utmost. To attain this end, emotional thinking must be kept at a minimum. The child should be brought up in an environment that is as normal and as conducive to physical and mental health as possible. His efforts and opinions should be regarded with respect and consideration in order to prevent him from developing a sense of inadequacy that leads to self-depreciation and paralysis of initiative.

If the conditions outlined above are satisfied the child should eventually establish neuro-muscular patterns that will result in more efficient movement with consequent release of energy into productive channels.

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Poliomyelitis in Los Angeles County

Beginning in the Spring of this year, 1934, cases of anterior poliomyelitis began to appear in Southern California, and about the first of May there was a rather sharp increase in the number of cases in Los Angeles County.

Five cases were reported the week ending May fifth and the number increased to two hundred and nine cases for the week ending June thirtieth, then they started to decrease and for the week ending August third there were only seventy-two cases. The total number of cases reported to August third for the entire Los Angeles County was 1741 cases. Six hundred and fifteen of these cases are in the County territory under the supervision of the Los Angeles County Health Department. The rapid decline since July first would indicate that the epidemic is drawing to a close.

The Los Angeles County Poliomyelitis Board was formed to bring to bear all the known scientific facts for the protection of the public. This Board was made up of representative physicians and health officers and one of the first things they did was ask the cooperation and assistance of the members of the local Chapter of the American Physiotherapy Association. Our executive committee met with a representative of the Board, and ways and means were discussed. We pledged our cooperation and at once sent the Board a list of physical therapists who were immediately available and a list of those who had positions but who were willing to volunteer their evenings, their free half days, and their Sundays.

It was decided by the Board to have muscle tests taken on every case to aid in proper splinting in order to prevent deformities by protecting the weakened muscles.

The first part of June, Dr. J. L. Pomeroy, Los Angeles County Health Officer and members of the Poliomyelitis Board went to the Board of Supervisors and asked for an appropriation to employ physical therapists to carry out their plan, and it was granted. A supervisor and six physical therapists were then employed by the County Health Department for muscle testing.

Muscle tests were made on all suspected cases as well as positive cases and also on many known contacts, and some missed cases were discovered in this way. A recheck was made in from two weeks to a month later and many cases that were apparently normal in the first test showed muscle weakness in the second and vice-versa. Every patient needing treatment was advised to have it and those who could not afford private care were referred to either the General Hospital, the Orthopedic Hospital, or the Children's Hospital. Follow-up calls were made to be sure they were under treatment as advised.

There have been comparatively few cases with extensive residual paralysis and so far very few deformities. This statement is based on the cases tested after they left the General Hospital and those cases which were quarantined at home. No doubt some of the more severe cases have been retained at the General Hospital where they are receiving treatment in the Physiotherapy Department.

We hope to have a muscle test on every case reported to the County Health Department. Unfortunately this service is limited to patients living in the County territory under the supervision of the Los Angeles County Health Department and only six hundred and fifteen cases have been reported from this area.

Southern California Chapter.

Pioneer Work in San Diego

Ten years of experience in a growing city has proven more than interesting. We have had exceptional opportunities here; not only for treatment work, but for observation of the really remarkable change in public knowledge and appreciation of the work.

Starting here ten years ago with three or four crippled children from the usual causes, i. e., polio, spastics, and some congenital deformities, it has been with many big strides that we have marched to the present day acknowledgment of the Crippled Children's Society of San Diego.

Until two years ago, little was done for the crippled children. In February 1932 a branch of the Society for Crippled Children was organized here. Since then, under the Society's care, many conditions have been im-

proved. In educating the public to the realization of and the responsibility for the crippled children in the community, one has learned much of the "inner doings" of these children and their homes by personal contact with both the children and their parents or guardians.

Building brick by brick and step by step to the modern times and the realization that more must be done, led finally, at the end of these ten years, to the realization of the ambition for these children—the hydrogymnastic pool. It is really here and we hope to open it on September first.

Six months ago, few people knew about the crippled children in this city, yet when the drive to raise the $20,000 necessary to erect the building was started, so great was the response that the money was raised and the pool is now near completion. Our task was twofold; we not only had the money to raise, but the public had to be educated as to what the Crippled Children's Society of San Diego was and what our plans were. All of this money was raised by small contributions, each doing his or her share, from the unemployed laborer on the street to the highest classes in the city.

The pool is to be twelve by twenty and will have a fine gym in connection. There is plenty of room to build on to where some day we hope to have an up-to-date Children's Hospital, combined with an Orthopedic School, occupational therapy, and all the latest to be done for the handicapped child.

Southern California Chapter.

We Need Help and Suggestions!

We read much of how prone we are to criticize and direct activities of those who are making an honest endeavor to serve and to help in these perilous days. It might be well to apply this criticism to ourselves as individual chapters. The Oregon Chapter has lost prestige due, in part, to the separation of our members, but even before that took place, we found it difficult to interest members in the monthly meeting. A lecture by a well-known surgeon would sometimes bring forth a quota. We had and have very able active people but there is a lack of interest, and we would welcome suggestions or advice from the Association members as to how to proceed to stimulate meetings during the winter.

Measures of various kinds have been used to interest physicians in our problems, but we continue to appear the step-child of the medical profession. We hear of the hospital using physical therapy, but inquiry brings forth the information that the sole therapy is hyperpyrexia. Industrial accident patients come forth after many months' hospitalization unable to move a joint. The writer has in mind a recent entry to a clinic of what had been septicemia involving upper and lower extremities, no attempt having been made to educate the patient as to how to begin "limbering up." The fault cannot entirely lie with the big bad wolf—depression—; it must lie somewhere within ourselves. I have been an Association member for many years and feel grieved to watch what appears to be the demise of an honorable friend.

The Review Editors could apply resuscitation methods in a forum whereby we could air our griefs and joys, and so be of help to each other. Notices of Chapter activities fill me with envy and awe as to how it is done. To quote President Roosevelt, "Let us cease to be sectional." Let us hear from associate members.

Oregon Chapter.

One Suggestion

If only everyone could come to the conventions! If, even, each chapter could send a goodly number of delegates who would take back home the inspirations received at the meetings! But since our country is so large and distances so great and railroad fares expensive, this ideal state cannot be attained. Those who are fortunate enough to get there now and then, realize how isolated must be the feelings of those who are far away in remote parts where perhaps even a chapter does not exist.

Appreciating something of this situation, the editors attempted, during the past year, to bring the chapters, at least, a little closer together by inviting them to send in news items. The editors tried to "make it easy" for the chapters by requesting only bare statements of activities; yet, to get even that much, was like trying to pull a child's first tooth. It is difficult, to be sure, to write up some interesting doings of the chapter when other business presses itself upon one's time, but if the chapters would send in their bi-monthly contributions—just contributions, not necessarily essays of perfection—we might have a column, not only of interest, but of real help.

Nor is it the desire to confine this column to the chapters. Surely, members-at-large must be doing things and must know about professional events in their localities which would be of interest to Review readers—things which perhaps would not call for formal articles, but which would make worthwhile items. As a matter of fact, the members-at-large should have especially new and fertile fields from which to draw, for these members are usually in more remote corners, which corners are not "overworked" as are centers like New York and Chicago and San Francisco.

The Review editors hope that all members of the Association will take part, from time to time, in this "members' column." And the editors request, nay beg, all contributors to send their material well before the eleventh hour before copy must go to press—to the associate editors *not later than* the fifteenth of October, December, February, April, June, August; or to the editor not later than the twenty-fifth of the same months. It must be remembered that the members of the Review staff are doing physical therapy as well as editing the Review.

ABSTRACTS

John S. Coulter, M. D.

Sciatic Neuralgia: A Clinical Entity

Its Symptoms, Diagnosis and Treatment, with a Report of Sixty Cases.

Emil D. W. Hauser, M. D., Chicago, in J. A. M. A., 102:18:1465, May 5, 1934.

Sciatica is a reflex neuralgia or a referred pain along the distribution of the sciatic nerve; it should be distinguished from sciatic neuritis, which is an inflammation of the sciatic nerve.

An inflammation of the sciatic nerve may be either primary or secondary. Primary sciatic neuritis is due to a generalized toxemia, as from alcoholism, lead or arsenic poisoning, or it may be the result of a systemic disease, such as diabetes or syphilis. The secondary group is likewise a peripheral neuritis but is due to pressure on the nerve usually before it leaves the pelvis, as from spinal cord tumors that exert pressure within the canal, or metastatic tumors that press on the sciatic root, plexus or trunk; pelvic tumors may give unilateral pressure on the plexus or nerve.

Before a reflex sciatica can be diagnosed, sciatica neuritis must be excluded. Unlike sciatic neuritis, the neurologic manifestations in reflex neuralgia are normal. The roentgenogram of the lumbosacral spine and pelvis is negative. Toxemias and constitutional diseases must be ruled out. The diagnosis does not depend exclusively on differentiation from neuritis. There are positive symptoms and observations, the presence of which is certainly suggestive if not conclusive. The sciatica is preceded by symptoms of muscular insufficiency in the lumbar and sacro-iliac region—intermittent ache and tiredness, stiffness and soreness, constant ache, localized boring pain over the lumbo-sacral angle or over one or both sacro-iliac joints, and signs of inflammatory reaction in these joints. At the same time, physical examination during an acute attack shows muscle spasm in the lumbar area; a protective list is present; Lasegue's sign is positive on the side of the affected nerve; the posture, particularly between acute attacks, is poor; the normal curves of the back are increased. In about one-half of the cases there are signs of a generalized nervous fatigue and irritability; in some instances this reaches such a degree that neurasthenia is diagnosed. The frequency with which weak feet and varicose veins accompany the neuralgias is regarded as further proof of the presence of physical strain.

A study of these neuralgias and a review of sixty cases led to several interesting conclusions: first, that this condition is not a true neuritis but an essential reflex sciatica neuralgia; second, that the referred pain is not confined to the sciatic nerve; third, that the origin of these pains may be attributed to muscular insufficiency or physical strain; and fourth, that any environmental condition which strains the nervous system acts as a contributing factor.

Much of the back pain in arthritis of the spine is due to muscle spasm and secondary reflex neuralgia, and only part of the pain is due to pressure on the nerve. The relief of muscular insufficiency gives distinct improvement in cases of arthritis of the spine with sciatica. Further arthritic treatment, such as the careful elimination of foci of infection and the discriminate use of vaccines, is essential to establish a cure. The latter is particularly true when the arthritic changes in the spine are part of a generalized or a chronic infectious arthritis. On the other hand, it is possible to have secondary arthritic changes limited to the lumbo-sacral and sacro-iliac joints as the result of continued irritation secondary to prolonged strain on these joints from muscular insufficiency of long standing. The cure of the muscular insufficiency in these cases assures permanent relief of all symptoms. The few instances in which the nerve came to the neuropathologist showed no sign of degeneration or inflammation, nor any abnormal change. In each case there was a definite relationship between the presence of static disturbance and the development of sciatic symptoms. Foci of infection, whenever present, were eradicated, since infection tends to increase the functional insufficiency and to make the irritation more persistent.

These ideas are in accord with Linstedt's views; that chronic irritations result from functional fatigue; that functional fatigue, in his cases, was secondary to organic alteration of normal body statics; that the irritation of chronic fatigue may make the nerve of the involved part hypersensitive and produce pain along the course of the nerve. When such pains occur in the region of the sciatic distribution they are called sciatica. These views were confirmed by Haglund's vast experience; he also found that the removal of functional insufficiency by means of orthopedic measures cured the sciatica. A detailed description of the treatment of muscular decompensation is not within the scope of this article. In the sixty cases reviewed, relief was obtained in each case as soon as a functional compensation was reestablished. These observations cover a period of seven years, during which time the patients have remained well.

The Latest Development in the Treatment of Fractured Spines

James T. Tucker, M.D., Richmond, Va., in Virginia M. Mo., 61:3:154, June, 1934.

The actual reduction of the compressed fractured vertebrae is accomplished by hyperextension of the spinal column. Local or general anesthetic may be used.

It was Dr. A. W. Rogers, of Massachusetts General Hospital, who proved that hyperextension of the spinal column could be carried just so far, because through experimentation he found that the anterior longitudinal ligament that runs along the anterior surface of the bodies of the vertebrae and is attached at the upper and lower lip of each vertebra, has a tensile strength equal to that of the tendo-achilles, and that when the spinal column is hyperextended, this anterior spinus ligament serves as a check rein to the degree of hyperextension possible. With pull on each lip of the bodies of the vertebrae, restoration of the height of the vertebrae is obtained. A non-padded plaster jacket is applied while the patient is hyperextended, fitting well up on the

sternum and down over the pubic bone. The secret of the subsequent treatment depends on proficient immobilization by means of this jacket.

When there is no abnormal nerve manifestation, the patient is got upon his feet on the second to fourth day and made to exercise immediately.

Exercise by squatting, pulling up on rings, flexion of extended legs on abdomen and extension of back on thighs was started. Weights of fifteen pounds were carried on the head and increased gradually until sixty pounds were carried. With this daily routine the patient progressed to the extent that he was much stronger than he was before the accident.

The key to the success of the new treatment of all fractures is active motion of all muscles about the injured part. Active motion is started immediately instead of putting the part at rest, allowing the muscles to dwindle away, muscle tone to diminish, stagnation of circulation to occur. This serves two important physiological functions.

We know that muscles serve as the heart to the venous system; therefore, active motion maintains muscle tone, which, when lost, is as debilitating as the fracture itself, but when maintained, through activity, supplies the fractured area with more normal blood supply, a quicker healing of the injured part, and a reduction to a minimum of the post-healing disability.

Five cases of compressed fractures of the bodies of the vertebrae have been treated under my observation within the past six months. All of these cases have completely recovered under the regime outlined above and are back at their various occupations without a mechanical support and without physical deformity, limitation of motion, pain or discomfort.

Active motion of the muscles about the fractured area, not only in cases of fractured vertebra, but in all types of fractures, hastens healing by a more normal physiological supply of blood to the part, increases muscle tone and thereby eliminates any mechanical support following healing of the fracture.

Postural Treatment of Visceroptosis

W. Osler Abbott, M.D., Philadelphia, in Penna. M. J., XXXVII:9:743, June, 1934.

The problem of what to do for the so-called visceroptotic patient confronts every doctor sooner or later.

The most commonly recommended measures are rest, a high caloric diet (sometimes with insulin), sedatives, an abdominal support, and even such psychiatric procedures as psychoanalysis. In severe cases one is apt to see many, if not all, these treatments applied simultaneously in a regime that frequently keeps the patient quite comfortable while living as an invalid, but fails to enable him to earn a living. Of the more specialized forms of treatment the Goldthwait method of postural correction is outstanding. It has frequently been found effective in relieving the symptoms ascribed to visceroptosis.

It seemed to me worth while to try to determine what results could be achieved among the out-patients of a hospital clinic without special instructor or technician and so far as possible without recourse to other coincident treatment. The specific questions to be answered were: (1) Can posture be corrected and the correction maintained after supervision ceases; (2) does relief of the symptoms commonly ascribed to visceroptosis follow correction of posture, and (3) what specific symptoms are most commonly affected by postural correction.

In an attempt to answer these questions, seventeen patients were selected from the Gastro-intestinal Section of Medical Clinic of the University Hospital. All presented the picture of visceroptosis with defective posture. In age they ranged from fifteen to fifty-two years, four being men and thirteen women. All had been symptomatic for periods varying from three months to six years, and in most instances had been subjected to various treatments without relief. The standard regime for each patient consisted of a three months course of postural exercises. Seven visits were made to the clinic during that time for instruction by the doctor and twenty minutes of exercise twice a day were taken at home. At the termination of the period of training, supervision was discontinued. After eight months a follow-up examination was made at which time both symptoms and posture were corrected. In practice this schedule can only be approximated.

The exercises used in this study were essentially those of Goldthwait, as described by Cochran, Thomas and others. They are designed to correct the specific postural defects of the asthenic patient. The extensor muscles of the neck and the dorsal spine are exercised to restore the erect carriage of the head. The chest is expanded and the ribs elevated by breathing exercises. To correct the lumbar lordosis the tone of the gluteal muscles is increased and the pelvis rotated posteriorly. Finally, control of the abdominal muscles is taught until the pot-bellied individual is able to hold the lower half of the abdomen constantly contracted while the upper part remains relaxed. The gross end result of this procedure is to approximate the anterior abdominal wall to the lower lumbar vertebrae, converting the abdominal cavity into a form suggesting an hour-glass in which the truly pelvic organs are protected from the crowding in of abdominal viscera from above. What subtler changes occur in the patient one cannot say.

At the outset elaborate methods of measurement and postural recording were used. These were given in preference to a simple estimate of postural correction made by observing the patients as they came and went in the dispensary unaware of the fact that they were being observed. Symptomatic improvement was also estimated.

The results of this study have justified in large measure the favorable reports by those using postural treatment for visceroptosis. Though some patients failed to maintain the degree of relief recorded at the end of treatment, nevertheless, certain individuals not only achieved complete relief but maintained it for many months after supervision had ceased. The test was a severe one, moreover, as every effort was made to keep those who were employed at work rather than to include rest, special dieting, and other factors impractical for a dispensary patient who must keep himself alive in spite of illness.

From these observations one may draw certain conclusions concerning the applicability of this form of treatment to the average patient of the class that cannot afford the expensive accessories available only to the few. In the first place, without apparatus and as a result of seven visits to the doctor, correction of posture may be achieved, and in a fair proportion of cases may be maintained indefinitely. In the second place, postural correction and relief of symptoms have exhibited a close enough association to justify one's viewing them as cause and effect. Finally, though the mechanism by which it is brought about is obscure, the character of the symp-

toms relieved is strong evidence that the function of the gastro-intestinal tract has been restored to normal.

Xeroderma Pigmentosum

A Study in Sensitivity to Light

Francis W. Lynch, M. D., St. Paul, in Arch. Derm. & Syphilol, 29:6:858, June, 1934.

Xeroderma pigmentosum possesses such striking characteristics and is so well known to dermatologists that no description of the disease is required. Its hereditary tendency is well known; it acts as a recessive characteristic with no tendency toward sex differences. Consanguinity of the parents has been recorded in from 17 to 59 per cent of the cases and was regarded by Toyama as the reason for the high incidence in Japan.

There are a great number of diseases related to sensitivity to light; some are regarded as true sensitizations while others have a less direct relationship. Xeroderma pigmentosum, hydroa vacciniforme or aestivale, prurigo aestivales, eczema solare and urticaria solaris are usually regarded as true sensitizations. Hausmann and Haxthausen grouped the pruriginous and eczematous eruptions and believe that there is no sharp division among them.

That a number of drugs are capable of evoking a sensitization to light in different organisms was demonstrated by Tappeiner in 1899 (eosin, methylthionine chloride, U. S. P. (methylene blue) and acridine). Hausmann reported similar effects from hematoporphyrin. In a group of patients being treated for gonorrhea, Jausion observed a number of cases of sensitivity to light, and he proceeded to demonstrate that the sensitivity resulted from the use of acriflavine hydrochloride, which is a drug of the acridine group. Haxthausen observed a patient with psoriasis who exhibited sensitivity to sunlight, but not to ultraviolet radiation, following the use of acriflavine hydrochloride. The barbitals are capable of disturbing hematoporphyrin metabolism, and occasionally produce sensitivity to light (sulphonmethane, sulphonethylmethane, phenobarbital). Argyria is often more marked on the exposed parts.

A number of cutaneous eruptions are precipitated by exposure to sunlight, appear only on exposed parts or are made worse by continued exposure: lupus erythematosus and pellagra come closest to being accepted as true sensitizations. Some cases of lichen planus, acne vulgaris, rosacea, eczema and erythema multiforme are apparently made worse by light. Rubeola, varicella and vaccinia have been observed to appear earlier, produce a more intense reaction and involute more quickly on irradiated areas. The Pirquet and Schick tests, when applied to previously irradiated areas free from erythema, evoke a more intense reaction than is normal. Kreibich described a condition resembling scleroderma which followed exposure to sunlight.

The effect of light on the production of carcinoma of the skin was suggested by Unna and others, and recent experimental studies tend to substantiate their belief. There is an increase in the cholesterol and the cholesterol ester content of the skin after ultraviolet irradiation, and there is probably a relationship between this observation and the high cholesterol content of carcinomas of the skin.

Experimental Studies

The best available method of conducting this study was by the use of radiations through light filters. Inaccuracies result from the fact that though these filters are well standardized there is no sharp cut-off at definite wavelengths. As the source of radiation, I used a high pressure, low voltage mercury vapor arc lamp with a quartz enclosure. Such a source produces a fairly continuous spectrum in the field investigated.

Experiments were carried out on the trunk and thighs. As a control, identical exposures were made on the same areas of another child of about the same age and complexion.

The following exposures were made on the two children between May 7 and July 16, 1932. Neither child received any solar radiation except the little that came through open windows.

The source of light was capable of producing what we considered a standard erythema in one minute at a distance of twelve inches (30 cm.).

The first exposure of this erythema dose was made (1) through helioglass, (2) with no filter and (3) through windowglass. Observations were made several times in the first twenty-four hours and each day for ten days.

The erythema produced with no filter developed at about the same time, but that of the child with xeroderma pigmentosum never became so marked, faded less rapidly and resulted in slight scaling and hyperpigmentation. Localized deposits of pigment resembling pigmented nevi later developed in this area on the patient with xeroderma pigmentosum.

There was no reaction in either case to the exposure through window glass, nor did any appear following an exposure of ten minutes.

On both children an unfiltered exposure of one-half minute produced a reaction about equal to that seen after using helioglass for two minutes.

Experiments with Protective Measures

Betz, while experimenting with hematoporphyrin sensitization, found that relative tolerance could be obtained by repeated exposure to the causative rays, but this tolerance was so slight and transitory as to be of no practical value. Meyer, Sellei and Liebner have protected patients with hydroa vacciniforme against exposure by the use of previous ultra-violet irradiation. Juon, in his case of xeroderms pigmentosum, observed apparent desensitization two months later on areas previously exposed to ultraviolet radiation.

Many chemicals have been suggested as a means of protection. Most of these agents act by their power of absorption of radiation. It is known that petrolatum and other bases are capable of absorbing certain radiations. Several brief and entirely qualitative experiments were conducted with irradiation of areas on the body of the patient with xeroderma pigmentosum which were covered with the following preparations (the thickness of the film was not measured): (1) petrolatum; (2) 3 per cent resorcinol in petrolatum; (3) 3 per cent tannic acid in petrolatum; (4) 3 per cent quinine sulphate in petrolatum; (5) 6 per cent quinine sulphate in petrolatum. These local applications were removed immediately following the exposure. Following an exposure which was sufficient to produce a definite erythema on unprotected skin, there was a slight erythema with the preparation of resorcinol and none with the petrolatum alone or with the other preparations. With an exposure of twice this duration there was still no erythema produced through the quinine preparations, and the erythema effected through resorcinol was more marked than that produced through petrolatum alone. I am recording these observa-

tions but am unwilling to draw any conclusions from them. Yellow petrolatum was used in these studies.

Summary

I have reviewed the cutaneous conditions brought about by sensitivity to light, with attention to studies which have attempted to demonstrate the radiations involved in each disease.

Urticarial reactions can apparently be evoked by either ultraviolet or visible radiation.

Patients with prurigo aestivalis have been shown to be sensitive to visible radiations in most instances.

Most workers have demonstrated sensitivity to ultraviolet rays in hydroa aestivale and vacciniforme. This is in contrast with studies on experimental hematoporphyrin sensitization in which the sensitivity may be in the field of visible light.

In xeroderma pigmentosum there is sensitivity only to radiations shorter than visible light. In most cases this includes sensitivity to roentgen rays and similar radiation. Martenstein and Bobowitsch have formulated a theory that the sensitivity to ultraviolet light in early cases later moves down the spectral scale to the shorter radiations. In spite of the somewhat similar observations on sensitivity in hydroa vacciniforme and xeroderms pigmentosum, there are essential differences in the former in the clinical picture and the presence of hematoporphyrin products. The genetic factors (predominance of males in hydroa as contrasted with an equal sex tendency in xeroderma) also may be assumed to indicate a basic difference between these conditions.

I conducted experiments on a patient with xeroderms pigmentosum, using glass filters which transmitted groups of radiations of various wave lengths.

Even on previously unexposed parts the patient with xeroderms pigmentosum, who on first exposure to sunlight in infancy responded with a marked erythema (but not vesiculation) responded with erythema and pigmentation to doses which would evoke vesiculation on normal skin.

Microscopic examination of the skin twenty-four hours after irradiation sufficient to produce erythema showed a deviation from the normal reaction. In the child with xeroderma pigmentosum changes in the cells of the stratum spinosum usually observed in normal persons were almost entirely lacking, whereas, a heavy layer of parakeratosis was observed which was not seen in the normal child tested.

I could demonstrate no sensitivity to radiations of longer wave lengths than 310 millimicrons.

When exposed to radiations no shorter than 280 millimicrons the skin of the patient with xeroderma pigmentosum responded more rapidly and with more pigmentation than did the skin of the normal child.

With filtered radiations as short as 250 millimicrons the response was about normal except for the increased pigmentation.

The skin of the patient with xeroderma pigmentosum responded to unfiltered radiations less rapidly than the skin of the normal child and with more pigmentation.

The less rapid response of the skin of the patient having xeroderma pigmentosum to unfiltered radiations is probably due to a less rapid response to the shorter rays.

The reaction of the skin of the child with xeroderma pigmentosum was greater with filtered than unfiltered radiations, while in the normal child the greater reaction followed unfiltered irradiation.

As a result of these studies the child with xeroderma pigmentosum was demonstrated to be most sensitive to radiations between 280 and 310 millimicrons. No observations were made as the result from exposure to radiations outside the ultraviolet field.

Since few radiations shorter than 297 millimicrons reach the earth's surface it is the sensitivity to radiations of from 297 to 310 millimicrons which is of prognostic importance to the patient, and these constitute the radiations from which the patient must be protected.

Functional Efficiency and Body-Build in the Young Male Adult

H. A. Treagold, M. D., M. R. C. P. Lond., Group Captain, Royal Air Force. In The Lancet, CCXXVI: 5783:1377, June 30, 1934.

Functional Efficiency.—This term is used in the present paper to imply the possession of the three following attributes: (1) capacity to endure severe or prolonged physical stress; (2) capacity to endure severe or prolonged mental stress (3) a high resistance to disease and a more rapid recovery rate than normal if any such disease is contracted.

The conclusion to be drawn is that capacity to endure severe or prolonged physical stress, as illustrated by proficiency in athletics, is met with more frequently in over-weight than in under-weight individuals, but there is a definite exception to this general rule in the case of long-distance athletes in whom the converse occurs. The Mount Everest personnel is a good illustration of this point.

The greater the degree of under-weight on entry the higher is the probability of invaliding.

The minimum probable invaliding rate occurs among those who are 3 kg. to 6 kg. on entry.

In order to investigate the question whether different classes of disease were associated with different degrees of body build on entry, all cases were divided up into infective diseases (148 cases), non-infective diseases (90), and psychic disorders (102).

The commonest form of infective disease was pulmonary tuberculosis (37), in which only one case was over-weight (5 kg.) on entry. The most frequent diseases among the remainder were other chronic lung conditions exclusive of asthma. (14), chronic otitis media (30), and rheumatic carditis (19).

The commonest causes of invaliding in the non-infective group were epilepsy (24), defects of vision (18), organic nervous disease (13), and gastric conditions (9). Fig. 9 shows that the proportion of under- to over-weights on entry was less than in Fig. 8—i. e., 5 to 1—but still more than twice as much as the normal proportion on entry (Fig. 1).

The remaining group of psychic disorders includes the psychoses and psychoneuroses. This group is taken as illustrating the type of airman who would probably be incapable of withstanding severe or prolonged mental stress in that this type has already broken down under the minor stresses of peace-time. Here too the under-weight class shows a preponderance of 4½ to 1, less than in the other two groups but sufficient to suggest that the under-weight recruits as a class have less capacity to withstand mental stress than those whose body build is above normal.

Under-weights, apart from the tuberculosis risk which occurs mainly below the age of 30, are viewed as a whole with greater favor than over-weight individuals by life insurance companies owing to their better expectation of life. This is probably due to the relatively

sheltered lives they lead owing to their tendency to poor functional efficiency and also to their proneness as a class to arterial hypotension and consequent relative immunity to most of the cardiovascular catastrophes of later life. From the point of view of sickness insurance, however, the under-weight compared with the over-weight individual appears to be more undesirable owing to increased liability to disease.

Conclusions

There is a definite relationship between varying degrees of body-build and functional efficiency, whether viewed from the points of capacity to endure severe or prolonged physical or mental stress or resistance to disease generally.

Capacity to endure severe or prolonged physical stress as evidenced by athletic prowess is found most commonly among over-weights. An exception to this is seen in long-distance athletes among whom under-weight is commoner than over-weight.

Incapacity to endure severe or prolonged mental stress, as evidenced by invaliding from the Service through psychic disorders, is commoner among individuals under-weight on entry to the Service than among over-weights.

This applies also to disease as a whole, and particularly in the case of infective diseases, such as pulmonary tuberculosis. The greater the degree of under-weight on entry, the greater the likelihood of invaliding from the Service on medical grounds.

It is uncommon for over-weight individuals to become under-weight and vice versa.

As a general rule it is not difficult to distinguish between the "fit" and "unfit" types of under-weight by careful examination.

A Study of Some Physiological Effects of Ultraviolet Irradiations Upon Normal Adults

Hope H. Hunt and Jane M. Leichsenring, St. Paul, Minn., in Radiology, XXII:3:318, March, 1934.

The source of ultraviolet radiation was a new air-cooled mercury vapor arc lamp, with a Cooper-Hewitt Uviarc burner. This lamp was used only for this study during the two-year period and was tested from time to time by the zinc sulphide method of Janet Clark, to check the relative power of the lamp and its deterioration. No change was observed during the course of the experiment. The spectral emission curve, as reported by the manufacturer, indicated ultraviolet potency in the region of wavelengths 2,900-3,150 Angstrom units. The lamp was operated at 75 volts and thirty inches from the subject, the ventral and dorsal surfaces being exposed, with the burner directly over the trunk. The treatments were given as follows:

During the years 1930 and 1931 the subjects were irradiated once a week, the initial dose being one-half minute; the second, one minute and each succeeding dose increased by one minute until a maximum of ten minutes, front and back, was reached. Two ten-minute treatments were given.

During the years 1931 and 1932, the subjects were irradiated twice a week, the initial dose being one-half minute, and each dose following increased by one-half minute front and back, to ten minutes. The semi-weekly ten-minute irradiations were continued from three to four weeks, provided no discomfort was felt.

The hemoglobin of the control groups behaved similarly and the general trend was much like that of the first year's radiated group. The radiated group the second year had a definitely higher average in the spring than at the beginning of the observations in the preceding fall. The increase was not gradual and maintained, but showed several peaks. The maximum ultraviolet dosage, reached and maintained from about the eighteenth or twentieth week to the twenty-second, did not keep the hemoglobin percentage above 85. The marked drop in hemoglobin during the Christmas holiday and that in the later weeks of radiation (1931-1932) might result from a previous apparent rather than a real increase, due to the temporary mobilization of hemoglobin reserves from different parts of the body. The hemoglobin increases in the post-radiation periods may in some unidentified way be associated with seasonal factors or slight changes in general group activities. Possibly, also, for the purposes of stimulating hemoglobin formation, several short radiation periods, with breaks between them are more effective than a continued treatment. Accepting 4,500,000 red cells per cubic millimeter as the normal for women, color indices fluctuated, but showed a general decline from fall to spring, followed by an increase. As Spence found that the red cell count usually increased faster than the hemoglobin, it is possible to have a decreasing color index (Period 3, 1931-1932), while both red cells and hemoglobin are increasing.

In accordance with the work of Garrey and Butler, Ashmarin and Alekseo-Berkman, and Smith and McDowell, it would seem that irregularities observed in the total white cell counts were due to factors other than ultraviolet radiations, such as lack of physical or mental relaxation and infections.

The number of colds among the members of both control groups was the same, though the personnel differed. A decrease in total number of colds and estimated days of infection will be noted in the radiated group the second year.

Summary

During the winter months of the years 1930-1931 and 1931-1932, two groups of healthy women were subjects for a study of the effects of ultraviolet radiation upon certain factors of clinical significance, such as temperature, pulse, respirations, blood counts, and blood pressure. The use of cod liver oil or other vitamin D preparations was forbidden all subjects. One-half the group each year (six subjects) received ultraviolet radiation after the various weekly observations were made and blood samples taken. The control groups received no radiation during the experimental periods. During the second year (1931-1932) treatments were given twice, instead of once, a week and the subjects received approximately three times the amount of ultraviolet radiation as that given a similar group the preceding year.

Hemoglobin production appeared more pronouncedly affected the second year than that of the first, though the effect did not continue indefinitely. It has not been determined whether this hemoglobin increase was real or apparent, due to the temporary mobilization of the hemoglobin reserves of the body.

The slight increase in the average total red cell count cannot be attributed to the effect of ultraviolet rays, as the control group behaved similarly.

The color indices of all groups decreased in a comparable manner from fall to spring.

Body temperature, pulse rate, and respirations appeared to fluctuate irrespective of ultraviolet radiations.

Throughout the first experimental periods the average systolic and diastolic pressures of the control group showed a slightly greater decrease than that of the irradi-

ated group. The second year the decreases were almost identical.

The total white counts appeared to be influenced less by ultraviolet rays than by other factors. During the first year the average percentage of polymorphonuclear cells of the radiated group increased and the lymphocytes decreased. The reverse was true during the second year.

With the greater amount of irradiation (1931-1932), the number of colds appeared to have been favorably influenced.

Irradiation as here administered, produced no manifest effect upon appetite, weight, sleep or physical efficiency of the group as a whole.

In general, ultraviolet radiation did not seem to influence type or regularity of menstrual flow. In one case only did there seem to be a decrease in blood-clotting time and in the amount of the menses.

The normal individual seems to have powers of compensation sufficiently great to counteract any stimulation resulting from ultraviolet radiation as administered in this study. Hence, in the various factors considered, the more nearly the person approached the physiologic norm, the less evident the effects from moderate ultraviolet radiation treatments.

Hemiplegia

Anthony Feiling, M.D., F.R.C.P., Physician and Dean of the Medical School, St. George's Hospital; Physician, Hospital for Epilepsy and Paralysis, Maida Vale, and the Royal Orthopedic Hospital. The Practitioner, CXXXIII:1:62, July, 1934.

This author says that: "The vascular lesions of the brain responsible for the great majority of cases of hemiplegia are as follows: (1) Arterial obstruction with resultant cerebral softening due to embolism, or thrombosis; (2) Arterial hemorrhage.

The most common cause of cerebral embolism is the detachment of a fragment of blood clot from the left side of the heart, probably in most cases from the left auricle. This is found in cases of mitral stenosis with or without auricular fibrillation without any co-existent valvular disease.

The next most common condition in which embolism is likely to occur is malignant endocarditis, when a portion of a vegetation may actually become detached from the mitral or aortic valves.

The most important cause of thrombosis of the cerebral arteries is a reduction of their lumen due to a thickening of the intima. This occurs most frequently in (1) atheromatous disease of the arteries, and (2) syphilitic endarteritis.

Arterial hemorrhage into the substance of the brain is a less common cause of hemiplegia than is thrombosis in the arteries, but is undoubtedly a more fatal lesion. The principal factors concerned in the production of an intracerebral hemorrhage are degeneration of the arterial wall and a high blood pressure. The arterial degeneration may be of an atheromatous type, most often found in later life, or it may consist in degenerative changes in the media following generalized arterial hypertrophy (arterio-capillary fibrosis) with associated fibrosis of the kidneys. The well recognized picture of cerebral hemorrhage, generalized arterial hypertrophy, enlarged heart and granular kidneys is familiar and needs no further emphasis.

Treatment

The essential treatment of any hemiplegia is that of the underlying disease which has produced this symptom. Space, however, will not allow more than an outline of certain principles. On account of its practical importance, the immediate treatment of cases of hemiplegia due to the vascular lesion of the brain will be considered, together with a few remarks on the treatment of the paralyzed limbs themselves by physiotherapeutic methods.

The immediate treatment of the unconscious patient is the same whether the vascular lesion be due to embolism, thrombosis or hemorrhage. Absolute rest is essential, and the patient is better left for a time wherever he may be rather than immediately removed to his own bed. The head and shoulders should be slightly raised on a pillow, taking care that the head is not thrown too far backward nor the chin allowed to fall forward, since it is important to maintain a free return of venous blood from the head. Any tight clothing around the head and chest must be removed. No attempt to feed the unconscious patient must be made, but should the coma last for more than twenty-four hours rectal injections of glucose and saline solution may be given. As soon as the patient regains consciousness, small liquid feeds should be given at first.

In the presence of restlessness and irritability which are apt to follow the return of consciousness, especially in cases of hemorrhage, sedatives may be required.

As soon as possible after the onset, it is important to distinguish, in the first place, those cases due to cerebral thrombosis from a theroma in elderly patients. In such cases a stimulating line of treatment is indicated, and with a feeble pulse and a low blood pressure cardiac and vasomotor stimulants may be needed, such as injections of strychnine gr. 1/30 every four hours, or of caffeine sodium salicylate gr. 2 to 3, or of camphor ½ to 2 gr. in ether and olive oil.

In younger patients, say, between the ages of forty-five and sixty, with a high blood pressure and a hypertrophied heart and other symptoms indicating the probability of hemorrhage, depletive methods of treatment may be considered. Of these measures, venesection and lumbar puncture are the two available. Venesection is particularly indicated when, in addition to coma, we find cyanosis, stertorous breathing, congestion of the face and a rising blood pressure. The danger of venesection is that the arterial pressure may be lowered to such an extent that it is insufficient to maintain an efficient circulation through the brain. Lumbar puncture is probably more free from risk, and in these cases the removal of cerebrospinal fluid is often followed by benefit. Moreover, if the fluid be blood-stained, we acquire definite evidence of the hemorrhagic character of the lesion.

In cases of thrombosis due to syphilis the administration of iodides may be started as soon as possible.

Little in the way of physical treatment of the paralyzed limbs can be carried out during the earlier stage of recovery from a hemiplegia. It is, however, very important to prevent the acquisition of faulty positions of the joints, for with the subsequent development of spasticity in the muscles these are difficult to correct. Care should be taken, for example, to prevent the foot being kept in the dropped position, for the subsequent development of hypertonus in the calf muscles may easily produce a spastic equinus deformity, severe enough to need operation for its correction. Even in the early stages, therefore, passive movements of the joints should be performed regularly to prevent the acquisition of periarticular adhesions and contractions of muscles. With these passive movements gentle massage may be combined. Electricity applied to spastic muscles is worse

than useless, and the only form in which its use is permissible in spastic paralysis lies in the application of heat by diathermy. As soon as any voluntary movements are possible, the patient must be made to carry them out daily. In long-standing cases of hemiplegia severe spastic deformities may be found and are, of course, particularly common in the infantile hemiplegias. The correction of such deformities, however, lies in the province of the orthopedic surgeon and cannot be described here.

Congenital Scoliosis

A Review of Seventy-seven Patients

John J. Kuhns, M.D., Assistant Orthopedic Surgeon, Children's and Robert B. Brigham Hospitals. In N. E. J. M., 210:25:1310, June 21, 1934.

Good results can be obtained by many methods, as the end results from this clinic have shown. Adequate treatment for congenital scoliosis must include: 1. Mobilization of the rigidity and lessening of the curvature of the spine, which should be carried out not too rapidly or forcefully. 2. Strengthening of the muscle groups which support the spine, by exercise. 3. The development of the best posture obtainable with the deformities which are present. 4. Such upbuilding measures as are indicated to improve the general health. Any treatment that is undertaken should continue until full growth in stature has occurred, since the changes which come with increase in height modify the mechanics of the spine to a certain degree throughout the growing period.

For congenital scoliosis in infancy we have found the most effective treatment to be the use of a molded plaster shell which holds the spine in a slightly overcorrected position. This can be made while the child is held with the curvature overcorrected as described by Harrenstein or a turn-buckle shell can be given, as reported by Brewster. Such procedures have been found to be far more effective than the strapping of the child to a Bradford frame. Where there are severe congenital abnormalities it has been found advisable at times to continue treatment in recumbency with a plaster shell, long beyond the usual period for beginning to walk. In the less severe cases at the usual time for walking, a plain plaster jacket is applied with the child in suspension, and the child is permitted to creep and walk in this. Where much curvature persists, a turnbuckle jacket is used. Reinforced corsets of canvas or leather have been found unsatisfactory in maintaining the correction in the spine except in the congenital scoliosis of mild degree.

In the last ten years exercises have been given in practically all cases of congenital scoliosis in conjunction with some type of support. These exercises have been of two kinds; mobilizing exercises to overcome contractures of the muscles and ligaments, as described by Lovett, in order that the curvature might be lessened, and postural exercises to secure better general muscular development, to obtain better respiratory function and to improve the balance of the spinal column. In a number of the cases where partial correction of the curvature had occurred, the children were able to maintain the improved position with their own musculature. Attempts at correction both by turnbuckle jackets and exercises were continued as long as improvement in the spinal deformity was observed. Jackets and other spinal supports were removed gradually when no further correction could be obtained, and when the muscles which support the spine were well developed and the poise of the body was good.

Vigorous redressment as advocated by earlier writers has not been used. The rigidity and the bony deformities make it both a difficult and dangerous procedure in congenital scoliosis. Correction even by slow stretching is a sufficiently difficult procedure except in the very young. We have found that it is much easier to start in infancy and guide the spine into straighter growth with the gradual increase in height than it is to correct deformities.

Conclusions

Congenital scoliosis is not an uncommon spinal deformity. It comprises 11 per cent of the cases of structural scoliosis seen at the Boston Children's Hospital.

The vertebral deformities occur in early fetal life. We do not know as yet how to prevent their occurrence.

Early diagnosis is made too rarely. The deformity is usually the only physical sign.

Multiple deformities scattered throughout the spine were found in all except three children.

Treatment must begin early if good functional and anatomic correction is to be obtained.

Supervision must be continued until full growth has occurred.

Significance of Muscular Tonus for Blood Circulation

Abst. J.A.M.A., 102:15:264, April 14, 1934, from Klin. Wchnschr., 13:217, Feb. 10, 1934.

Mateeff and Petroff point out that gravitational disturbances in the circulation are due to the fact that, under the influence of the hemostatic pressure, the capillaries and the small and large veins of the lower portion of the vascular system become dilated and take up a larger amount of blood than is the case when the patient is reclining. The hemostatic pressure exerted on the inside of the vascular walls is counteracted by their elasticity and by the counterpressure of the surrounding tissues. The elastic resistance of the vascular walls is not constant but variable, depending on the tonus and the influence of the innervation. The authors think that the circulatory significance of this vascular tonus should not be over-estimated and that the hemostatic pressure is counteracted mainly by the pressure from the surrounding tissues, especially from the muscular tonus. If the latter factor really has this predominating significance for the circulation, it is to be expected that persons with a pathologically decreased muscular tonus are subject to circulatory disturbances when they are standing up. The authors investigated this problem on persons with reduced, increased and normal muscular tonus by determining the pulse rate and blood pressure when the persons were reclining and standing. They found that in patients with pathologically decreased muscular tonus the hemostatic pressure during erect posture produces a disturbance in the blood distribution which is so severe that in a comparatively short time (from five to twenty-five minutes) the circulation falls completely and the so-called gravitation shock develops. Bandaging of the lower extremities up to the pelvis by means of an elastic bandage counteracts the gravitational disturbances of these patients. In patients with pathologically increased muscular tonus and in healthy persons with good muscular tonus, the gravitational disturbances in the blood distribution are extremely slight. The normal muscular tonus prevents the abnormal dilatation of the capillaries and of the small and large veins of the lower parts of the body and facilitates the backflow of the blood to the right side of the heart.

Book Reviews

THE MEDICAL AND ORTHOPEDIC MANAGEMENT OF CHRONIC ARTHRITIS. By Ralph Pemberton, M.S., M.D., F.A.C.P., Professor of Medicine, Graduate School of Medicine, University of Pennsylvania, Chairman American Committee for the Control of Rheumatism, Member Council on Physical Therapy of the American Medical Association; and Robert Osgood, A.B., M.D., F.A.C.S., John Ball and Buckminster Brown, Professor Emeritus of Orthopedic Surgery, Harvard Medical School, Member American Committee for the Control of Rheumatism, Member Council on Physical Therapy American Medical Association. Cloth. Pp. 403, $5.00. The Macmillan Company, 60 Fifth Ave., New York.

In the average physical therapy department many of the patients treated come under the broad classification of chronic arthritis. It is a disease which is more influenced than any other by physical therapy. Therefore, for a person using physical therapy a book on chronic arthritis is important, but this book is especially so for two reasons. First, this book has been written because of the convictions of the authors that chronic arthritis is largely a preventable and curable disease and second, that current knowledge of the nature of the disease and of the measures necessary to combat it is not as generally diffused throughout the medical profession as it should be.

This book should be read carefully by everyone concerned in the treatment of chronic arthritis. The chapter on the physiological disturbances gives many physiological reasons for the use of heat, massage and exercise. Every physical therapist ought to be alive to the restorative and preventive value of the exercises given in the chapter on the Adjustments of the Major Bodily Systems, Mechanical Aids to Physiological Function. Even patients with advanced lesions of atrophic arthritis can always assume the favorable position in recumbency which are described, and can be taught to carry out most of the recumbent trunk exercises. A better understanding of these body mechanic exercises and a more general inclusion of them in the armamentarium of our methods will enable us to wage a more successful war on chronic arthritis.

It should be a great encouragement to everyone interested in physical therapy to read that these outstanding authorities believe that: "Study of the various measures of physical therapy has been of value in revealing the nature of their influence; and also in revealing the nature of the disturbance of physiology in arthritis corrected by them, and hence, something of the pathology of arthritis."

This book gives in detail the following program for the treatment of chronic arthritis. (1) The institution of rest to the muscular and nervous systems as a whole, including refined adjustment of the principle to the given individual and to the joints in particular. (2) The establishment of correct "body mechanics" by recumbent or also by erect postures which modify mechanical and gravitational handicaps to visceral function, and in the tone of otherwise fatigued or overacting muscles. (3) The institution of measures directed toward "optimal" nutrition, whatever that may imply or necessitate in any given case, along the lines of a low carbohydrate, high vitamin diet. (4) Attempts to modify already existing circulatory inadequacies if these have not already responded to the first steps of the program. This includes the intelligent and intensive use of physical therapy. (5) Treatment or removal of such precipitating factors as may be present in the form of focal infection. Some foci are easily removed and some can never be. This last possibility by no means necessarily invalidates the entire success of the program as a whole. (6) The administration of drugs to modify pain in severe phases, sedation of the nervous system when necessary, stimulation of the haemopoietic centers and wise use of the so-called constructive tonics in general. (7) The institution at this stage at latest, and earlier stages when necessary, of those measures within the orthopedic field which the book presents in detail.

Physical therapy has enormous value in the treatment of chronic arthritis when the way is paved for its use, but under other circumstances the use of heat, massage and exercise would aggravate it. Every physical therapist should carefully read this book to avoid the routine and unthinking use of physical therapy in arthritis.

CORRECTIVE PHYSICAL EDUCATION. By Josephine Langworthy Rathbone, M. A., Instructor in Physical Education, Teachers College, Columbia University, New York City. W. B. Saunders Company.

Miss Josephine Rathbone, instructor in Physical Education at Teachers College, Columbia University, feeling the need of teachers and students of corrective physical education and physiotherapy for a textbook on corrective physical education, has valiantly set herself to the task of writing such a book, and succeeded uncommonly well.

Hitherto we have had to rely for the greater part on textbooks written for medical students and as reference material for doctors, and some more elementary books written for nurses.

Miss Rathbone's book is of more than usual value for the advanced student of corrective physical education and to those majoring in physical therapy. In it she states that the two major aims of the book are: first, "To convince the student of health and physical education that one of his greatest concerns is to help children and young people to build efficient and beautiful bodies"; second, "To furnish the students with some basic fundamental facts upon which to build a sound program of reconstructive health and physical education."

She states further, "Different workers in the field have hit upon different technics." . . . "It is the duty of a student to become familiar with these methods and to choose those that accord with the best basic theory and principles," also, "If this book arouses in anyone the desire to study other methods of treatment and to thoroughly evaluate them, this author will be well pleased."

The first portion of the book deals with the anatomy of bones, joints and muscles, followed by a review of the neuromuscular system, reviewing and correlating, for the student who has not had recent work in these subjects, the anatomical and physiological phases of the work. This is followed by a very clear definition and explanation of correct walking, standing, and sitting positions, and the cardinal principles of body building.

The postural defects are next presented for consideration, with excellent differentiation and descriptions given. There is not much possibility of the elementary student being confused by a multitude of distinctions but rather he is held to a few, major types of faulty postures. Presumably these variations are to be worked out by the student as he progresses in the knowledge of postural defects and mild scoliosis. The full responsibility of a severe case of scoliosis is placed in the hands of the

orthopedic surgeon, as it should be, who determines the method of procedure in the case.

Miss Rathbone places a strong accusation against fatigue of various types as being a very great factor in our faulty postures. However, she does not fail to take into consideration the many other causes of these conditions.

In considering the types of exercises offered as a basis for compiling a group of exercises for corrective work, there has been no effort made to subscribe to any particular "system" of body building; but rather a very representative group has been presented to deal with definite conditions which are commonly found in faulty postures. They are very well described and illustrated with amusing "stick men" so that even those not accustomed to working out exercises could not fail to understand.

The author presents the common types of orthopedic conditions which are found in physical examinations of children, in order that they may be early referred to the physician.

In the chapter on Mental and Emotional Maladjustments, Miss Rathbone describes the importance of physical, recreational, and occupational Therapy in the readjustment of these conditions.

The importance of finding the right person to handle the reconstructive body building in the school is emphasized, and securing the co-operation of home, school, and physician as well as the child under consideration.

Miss Rathbone has presented in this book a wealth of knowledge and material well organized, and fitting the needs of the teacher of corrective physical education.

"I KNOW JUST THE THING FOR THAT!" By J. F. Montague, M. D., Medical Director, New York Intestinal Sanitarium. Cloth, pp. 265. Price $2.00. The John Day Co., Inc., New York, 1934.

This is a book for the public on gastro-intestinal conditions. It is written in an entertaining style that makes it easy to read. It helps to counteract the foolish and pernicious claims of patent medicines advertised on the radio, in newspapers and magazines and on billboards. It exposes many of the fallacies of the diet faddists and the physical culturists.

Books for public reading on medical subjects are of questionable value. Many gastro-intestinal conditions are classed under the neuroses. Individuals who exhibit general neurotic tendencies are surely not benefitted by reading a book going into detail on the entire list of diseases of the gastro-intestinal tract. The reader is informed in many chapters what to do and what not to do. Surely this can lead to self medication, and be as injurious to the patient as the patent medicines and faddists against which this book warns the reader.

Man's Redemption of Man

Within the life-time of some of us a strange and wonderful thing happened on the earth—something of which no prophet foretold, of which no seer dreamt, nor is it among the beatitudes of Christ Himself; only St. John seems to have had an inkling of it in that splendid chapter in which he describes the new heaven and the new earth, when the former things should pass away, when all tears should be wiped away, and there should be no more crying nor sorrow. On October 16, 1846, in the amphitheatre of the Massachusetts General Hospital, Boston, a new Prometheus gave a gift as rich as that of fire, the greatest single gift ever made to suffering humanity. The prophecy was fulfilled—neither shall there be any more pain; a mystery of the ages had been solved by a daring experiment by man on man in the introduction of anaesthesia.

Hospitals are no longer the scenes of those appalling tragedies that made the stoutest quail. To-day we take for granted the silence of the operating-room, but to reach this Elysium we had to travel the slow road of laborious research . . . and then brave hearts had to risk reputation, and even life itself in experiments, the issue of which was for long doubtful.—*Sir William Osler, Bt., M.D.*

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